THE

JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

[Registered as a Newspaper.]

Vol. XXXV. No. 881.] LONDON, MARCH 30, 1880. [32nd Year.] Price 6d.

GAS PURIFICATION
BY
OXIDE OF IRON.

COOKE BROS.,
CENTRAL DEPÔTS:
CO. DONEGAL, IRELAND;
LONDON DEPÔT:
BLACKWALL, E.;
OFFICES:
26, 27, & 28, FENCHURCH ST.,
LONDON, E.C.

GENUINE TORBAY PAINT
And SPECIAL GASOMETER PAINT.
Several Prize Medals. Established over 20 Years.
These Paints are now used by all the London Gas Companies and most of the principal Country Gas Companies, on Gasholders, Scrubbers, Purifiers, &c. Also used by the Admiralty, War Office, Railway Companies, Founders, &c. They prevent and arrest rust, and protect iron from the action of water, sulphurous and gaseous exhalations; do not crack, blister, or flake off; will cover tar effectually.
The covering powers are considerably greater than those of any other Paint.—*See "Engineer," Nov.* 2, 1866.
Supplied, mixed ready for use, or in paste, as desired.
TORBAY PAINT COMPANY.
Proprietors: STEVENS & CO.,
21, GREAT WINCHESTER STREET, LONDON.
Works: BRIXHAM, TORBAY.

THOMAS PROUD,
BROOKFIELD GAS APPARATUS WORKS,
108, ICKNIELD STREET EAST, BIRMINGHAM.
CONTRACTOR FOR
LAYING MAINS
FOR
Gas, Water, & Sanitary Purposes,
AND MANUFACTURER OF
WOOD GRIDS
FOR
SCRUBBERS AND PURIFIERS.

COWEN'S PATENT FIRE-CLAY RETORTS.
JOSEPH COWEN and CO.,
BLAYDON BURN, BLAYDON-ON-TYNE,
Were the only parties to whom a Prize Medal was awarded at the Great Exhibition of 1851, for "Gas-Retorts and other Objects in Fire-Clay," and they were also awarded at the International Exhibition of 1862, the Prize Medal for "Gas-Retorts, Fire-Bricks, &c., for Excellence of Quality."
J. C. and Co. have been for many years the most extensive Manufacturers of Fire-Clay Retorts and Fire-Bricks in the Kingdom. Orders for Fire-Clay Retorts of all shapes and dimensions, and to fit any shaped Mouthpiece, Fire-Bricks, and every other article in Fire-Clay, are promptly executed at their Works as above.
COWEN'S GARESFIELD COALS.
Jos. Cowen & Co. are the only Manufacturers of Fire-Bricks and Clay Retorts at Blaydon Burn.

JOHN RUSSELL & CO.,
LIMITED,
Established at the commencement of Gas Lighting,
Manufacturers of
TUBES AND FITTINGS.
THREE PRIZE MEDALS,
Paris, 1878.
Head London Office:
145, QUEEN VICTORIA STREET.
ALMA TUBE-WORKS, WALSALL;
OLD PATENT TUBE-WORKS, WEDNESBURY.

JOHN BENT & SON,
BELL BARN ROAD, BIRMINGHAM,
Manufacturers of
WET AND DRY GAS-METERS,
Licensees and Manufacturers of
HUNT'S
PATENT COMPENSATING METERS
STREET-LAMPS, &c., &c.
Established 1830.

THOMAS PIGGOTT & CO.,
SPRING HILL, BIRMINGHAM,
Manufacturers of
TELESCOPIC & SINGLE GASHOLDERS,
CAST & WROUGHT IRON TANKS FOR DITTO,
And Gas Apparatus of every Description.
Marine, Tubular, Cornish, Plain, Furnace, Saddle, and Range Boilers.
Sugar, Saltpetre, and all kinds of Pans.
Roofs, Girders, and Bridges, and General Smith's Work.
London Offices: 97, CANNON STREET—
JAMES E. & SAMUEL SPENCER, Agents.

THE
"OTTO" GAS-ENGINE.
See Page 470.

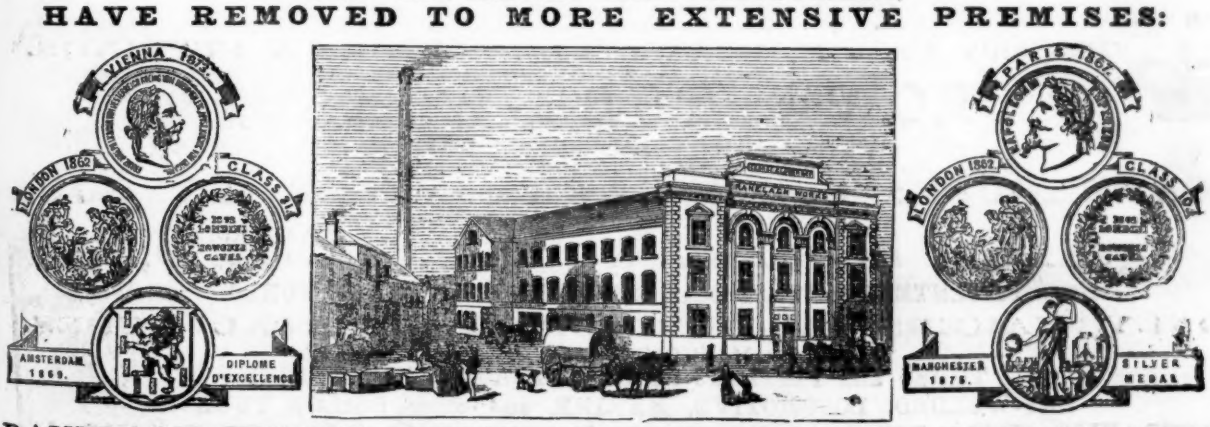
CROSSLEY BROTHERS,
MANCHESTER AND LONDON.

THE
DUKE OF HAMILTON'S
LESMAHAGOW
CANNEL COAL.
AGENT:
JAMES M'KELVIE,
HAYMARKET,
EDINBURGH.
ESTABLISHED 1840.

CHANGE OF ADDRESS.

GEORGE GLOVER AND CO.,

DRY GAS-METER MANUFACTURERS,
HAVE REMOVED TO MORE EXTENSIVE PREMISES:



RANELAGH WORKS, ROYAL AVENUE, CHELSEA, LONDON, S.W.

WELLINGTON TUBE WORKS,

GREAT BRIDGE, TIPTON, STAFFORDSHIRE.

JOSEPH AIRD,

GAS, STEAM, AND HYDRAULIC TUBES AND FITTINGS.

NO MORE WASTE LIME! SAVE THE VALUABLE PRODUCT!

G. R. HISLOP'S PATENT REGENERATIVE PROCESS

Most Effectively and Economically restores this waste *ad infinitum*.

The Patentee having devoted more time and attention to this subject than perhaps any other person living, is now in a position to recommend the adoption of this process to Gas Companies and Corporations with the utmost confidence in its practical utility, convenience, and economy. 1st. It restores the spent Lime at from one-third to one-half its original cost, apart from its undoubted convenience and the economy of space. 2nd. There is practically no limit to the duration of the Lime. 3rd. The cost of apparatus for the introduction of the process is very moderate and exceedingly durable. 4. The Patentee supplies special bricks and castings, erects and proves the process on the most favourable terms.

The process, in operation, may be seen at the Corporation Gas-Works, Paisley, where the Lime has been restored 120 times. Inspection is cordially invited.

For Terms, apply to GEO. R. HISLOP, F.C.S., Engineer, Gas-Works, PAISLEY, N.B.

ROBT. DEMPSTER & SONS,

GAS ENGINEERS, IRONFOUNDERS, AND CONTRACTORS,

ROSE MOUNT IRON-WORKS, ELLAND, YORKSHIRE.

MANUFACTURERS OF EVERY DESCRIPTION OF

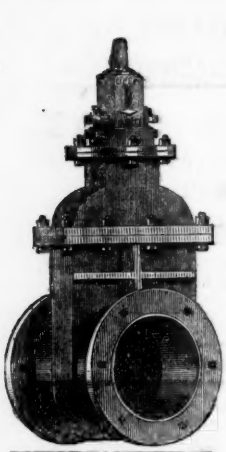
GAS APPARATUS;

CONTRACTORS FOR THE

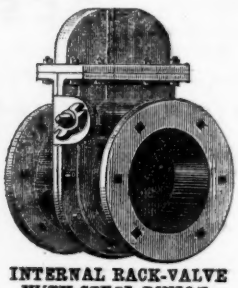
ERECTION OF PUBLIC AND PRIVATE GAS-WORKS.

Plans and Specifications Prepared, and Illustrated Catalogues forwarded on application.

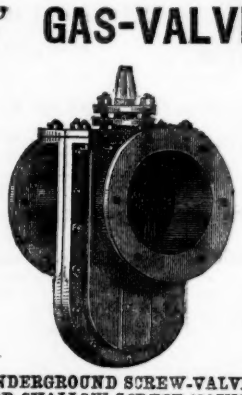
C. & W. WALKERS' GAS-VALVES.



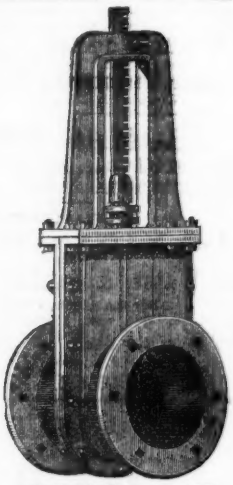
DOUBLE-FACED VALVE SPECIALLY FOR PURIFIERS.



INTERNAL RACK-VALVE WITH STEEL PINION, FOR GENERAL USE.



UNDERGROUND SCREW-VALVE FOR SHALLOW STREET-MAINS.



ORDINARY RACK AND PINION VALVE.

MIDLAND IRON-WORKS,

DONNINGTON, near NEWPORT, SHROPSHIRE; 8, FINSBURY CIRCUS, LONDON.

TRADE MARK.

THE MEDAL FOR 1862.

The only Prize Medal awarded for TUBES & FITTINGS.

CROWN TUBE-WORKS,

WEDNESBURY, STAFFORDSHIRE.

WAREHOUSE: SOUTHWARK STREET, LONDON.

JAMES RUSSELL & SONS, LIMITED,

PATENTEES & FIRST MAKERS OF WROUGHT-IRON TUBES,

ONLY MAKERS OF HOMOGENEOUS METAL TUBES.

MANUFACTURERS OF

TUBES and FITTINGS for GAS, STEAM, and WATER;

LAP-WELDED, LOCOMOTIVE, MARINE, and other BOILER TUBES;

HYDRAULIC TUBES, BEDSTEAD TUBES, WELL TUBES, TELEGRAPH POSTS, COILS, &c.,

GAS-FITTERS TOOLS, VALVES, COCKS, &c.

THOMAS PIGGOTT & CO.,

(Established 1822,)

SPRING HILL, BIRMINGHAM.

MANUFACTURERS OF

TELESCOPIC & SINGLE GASHOLDERS,

CAST & WROUGHT IRON TANKS FOR DITTO;

PURIFIERS, CONDENSERS, SCRUBBERS, RETORTS, VALVES;

IMPROVED WROUGHT-IRON RETORT-LIDS, CROSS-BARS, & SCREWS;

AND GAS APPARATUS OF EVERY DESCRIPTION.

SOLE MANUFACTURERS OF LIVESEY'S PATENT GASHOLDER MAN-LID,

By use of which Man-lid, inlet and outlet pipes can be examined and cleansed without loss of gas in crown of holder, or ingress of atmospheric air.

ROOFS, GIRDERS, BRIDGES, AND BOILERS OF ALL KINDS.

Drawings, Specifications, and Estimates supplied on application.

LONDON OFFICES: 97, CANNON STREET—JAMES E. & SAMUEL SPENCER, AGENTS.

EDWARD E. CROMBIE & CO.,

INVENTORS AND PATENTEES

OF THE

FRICTIONLESS DRY GAS-METERS,

Beg to intimate to Gas Companies and others that they are now prepared to supply these very superior Meters at the same prices as for the ordinary Gas-Meters.

In the construction of this Meter, for which the best tin plates only are used, every mechanical contrivance has been taken advantage of successfully to reduce the friction to a minimum, which is amply proved by the fact that they are made to work upon only one-fortieth of an inch pressure. By an improvement also in their construction, a steadier light is obtained, and greater capacity than can be got from any other Meter in the market. No gas can pass under the valves on any back pressure, as is the case with many other Dry Meters.

To Gas Companies supplying gas through streets with heavy gradients, these Meters are invaluable, as much gas is saved from the low pressure required to work them.

ALL METERS ARE UPHELD FOR FIVE YEARS.

METROPOLITAN WORKS, DIANA PLACE, EUSTON ROAD, LONDON, N.W.

SAMUEL CUTLER & SONS,

CONTRACTORS FOR GAS & WATER WORKS, GENERAL ENGINEERS, IRONFOUNDERS & MANUFACTURERS OF

GASHOLDERS, TANKS, PURIFIERS,

SCRUBBERS, VALVES, EXHAUSTERS, IRON ROOFS, BRIDGES, BOILERS, AND GENERAL CAST AND WROUGHT IRON WORKS.

S. C. & SONS undertake the entire erection of New, or Remodelling of existing Gas-Works in any part of the World, including small Works for MANSIONS, FACTORIES, &c., or Works of the largest extent (are now constructing the largest Gasholder yet erected); also the supplying and laying of MAINS.

They make a speciality of supplying every requisite whatever for Gas-Works, keeping in Stock what are most in request. WOOD SIEVES for Purifiers and Scrubbers, of a superior make.

SPECIAL CASTINGS to Drawing or Pattern at Shortest Notice.

Manufacturers of MORRIS & CUTLER'S PATENT CONDENSER & CUTLER'S PATENT GAS-WASHER.

DESCRIPTION OF MORRIS & CUTLER'S PATENT CONDENSER.—The Condenser may consist of pipes arranged in tiers, or in any other form most convenient to the site available, each tier being connected with special connections, and containing within same either one or more coils of smaller pipe through which water is passed, being supplied from any convenient source of supply, the water passing in an opposite direction to the gas so that the coldest water is at the gas outlet. The power of the Condenser can be regulated precisely in proportion to the quantity of water allowed to pass through, which is not in any way contaminated, but simply heated by the hot gas, and advantage can be taken of its being at a high level to carry it to a high-level cistern, from whence it can be used for supply to boiler or any other purpose. The Condenser itself may form the support for a high-level cistern. By an arrangement of valves the water may be shut off, and an air orifice opened, when air will pass through instead of water, or both air and water can be shut off. The power of the Condenser is, therefore, entirely under control. The Condenser may be seen in operation at the Brentford Gas-Works.

For further Particulars, apply to Mr. F. MORRIS, GAS-WORKS, BRENTFORD, or to S. CUTLER & SONS, PROVIDENCE WORKS, MILLWALL (Near the Steamboat Pier), LONDON, E.

DANIEL HOWARD,

(Successor to the late BENJ. WHITEHOUSE),

GASHOLDER AND BOILER WORKS,

WEST BROMWICH, NEAR BIRMINGHAM (Established 1765),

MANUFACTURER OF

TELESCOPIC AND SINGLE GASHOLDERS,

WROUGHT AND CAST-IRON TANKS FOR DITTO.

PURIFIERS, CONDENSERS, SCRUBBERS, HYDRAULIC MAINS, AND ALL KINDS OF GAS APPARATUS.

WROUGHT-IRON ROOFS, BRIDGES, GIRDERS, ETC.

STEAM, HOT WATER, AND RANGE BOILERS, TANKS, CISTERNS, BOATS,

AND ALL KINDS OF WROUGHT-IRON WORK.

Drawings, Specifications, and Estimates supplied on application.

GAS PURIFICATION

BY

OXIDE OF IRON.

GAS PURIFICATION & CHEMICAL Co., LIMITED,

PALMERSTON BUILDINGS, OLD BROAD STREET, LONDON, E.C.

JOHN WM. O'NEILL, Managing Director.

GAS *v.* ELECTRIC LIGHT.

WIGHAM'S PATENT LIGHTHOUSE GAS-BURNERS,

For Street Lighting and the Illumination of Large Halls, Factories, Ship Yards, &c., where Powerful Light is required.

These Burners have been adopted by a School Board, having large school-rooms in charge, because of their high illuminating power and the facilities they give for perfect ventilation. The actinic power of these Burners is such that they are used successfully for Photography and Photo-Lithography.

SOLE MANUFACTURERS:

J. EDMUNDSON & CO., Gas Engineers, 19, GREAT GEORGE STREET, WESTMINSTER, LONDON, S.W.

GEORGE BOWER,

GAS AND WATER ENGINEER AND CONTRACTOR,

ST. NEOTS, HUNTS.

Gas Apparatus supplied for **Works** of any magnitude, from those suitable for experimental purposes to those capable of producing one million cubic feet per day.

VERTICAL RETORT APPARATUS for small Private Works, and for Testing Coal.

DOUBLE-ACTING RETORT APPARATUS for Producing Gas from Oil, Resin, Peat, Wood, and Coals.

RETORT-FITTINGS, CONDENSERS, SCRUBBERS, ENGINES AND EXHAUSTERS, PURIFIERS, STATION-METERS, GASHOLDERS, GOVERNORS, METERS, CENTRAL CHANGE VALVES, FOUR-WAY BYE-PASS VALVES, & VALVES OF ALL DESCRIPTIONS.

GASHOLDER TANKS, IN CAST OR WROUGHT IRON.

HIGH-PRESSURE AND CONSUMERS GAS-REGULATORS. WET AND DRY GAS-METERS.

APPARATUS FOR LIGHTING RAILWAY CARRIAGES WITH GAS.

AIR-LIGHT APPARATUS.

LAMP COLUMNS, SHADOWLESS HEXAGONAL LANTERNS on the Interchangeable Principle.

Plans, Specifications, and Estimates for Gas-Works of any magnitude.

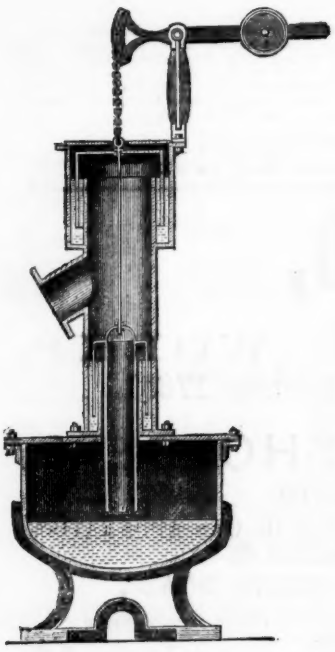
References in every Quarter of the World to Works erected during the past Quarter of a Century.

Second Edition of "The Gas and Water Engineer's Book of Reference," 4s. Companion, with Detailed Costs, 1s., post free.

SELF-ACTING REMOVABLE DIP-PIPE,

PATENTED BY

CHANDLER & STEVENSON.



The following Testimonials, as to five years constant working of this Patent Removable Dip, have been received:—

Metropolitan District Asylum Gas-Works, Caterham, Surrey, Jan. 15, 1874.

Messrs. CHANDLER and SONS.

DEAR SIRS,

In reply to your inquiries, I beg to inform you that since I have used your Patented Dips (ten in number), I find my make has increased over 1000 cubic feet per ton of coal carbonized, my usual make being 9070 cubic feet before using your Dips, and 10,150 cubic feet since using them.

Metropolitan District Asylum Gas-Works, Caterham, Surrey, Dec. 30, 1879.

Messrs. CHANDLER and SONS.

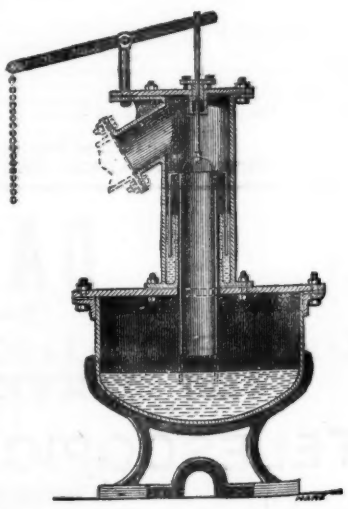
DEAR SIRS,

In reply to your inquiry, it is with very much pleasure that I endorse every word of my letter of Jan. 15, 1874; and I may add that from the date the Patent Dips were fitted, they have worked perfectly, and there is very little carbon deposited in the retorts, in consequence of the lower pressure.

Yours faithfully,

(Signed) W. CRICKMAY,

Memb. Soc. Engineers.



APPLICATIONS TO BE MADE TO

Messrs. CHANDLER & SONS,

104, NEWINGTON CAUSEWAY, S.E.

KIRKHAM, HULETT, & CHANDLER, LIMITED.

PATENT "STANDARD" WASHER-SCRUBBER,

FOR

GAS PURIFICATION,

TAKES OUT EVERY TRACE OF AMMONIA AND A LARGE QUANTITY OF CARBONIC ACID AND SULPHURETTED HYDROGEN BY ONCE PASSING THROUGH THE MACHINE.

AMMONIACAL LIQUOR OBTAINED OF ANY REQUIRED STRENGTH.

The Cost of the Machine defrayed by the Ammonia obtained in Twelve Months.

It requires very little attention, and cannot get out of order.

THESE MACHINES HAVE BEEN SUPPLIED TO THE FOLLOWING GAS-WORKS:—

	Feet per Day.
The Gaslight Company, London—	
Beckton	5,000,000
Bromley	7,000,000
St. Pancras	3,000,000
Bradford Corporation	1,000,000
Bremen	150,000
Buxton Local Board	250,000
Dukinfield Local Board	500,000
Driffield Company	100,000
Goole Company	250,000
Glossop Company	300,000
Holywood Company	125,000
Heywood Local Board	600,000
Leeds Corporation	2,000,000
Leominster Company	150,000
Maidstone Company	1,000,000
Phœnix Company, Greenwich	2,500,000
" " Vauxhall	3,000,000
Woolwich Equitable Company	400,000
Yeadon Company	500,000

AND MANY OTHERS ARE IN COURSE OF CONSTRUCTION.

TESTIMONIALS.

Messrs. KIRKHAM, HULETT, and CHANDLER. *Engine-Works, Millbank, Westminster, S.W., March 5, 1879.*

Gentlemen,—In accordance with your instructions, I have taken diagrams from Vertical Engine driving your Patent Horizontal Washer-Scrubber to purify 60,000 feet of gas per hour on the works of The Gaslight Company at King's Cross, and find the following results, viz.:—

Horse power required to drive engine, shafting, and gearing alone	= 0·398
Total horse power with washer on	= 1·721
Absolute horse power required to drive Washer-Scrubber	= 1·323

(Signed) THOS. HORN.

Messrs. KIRKHAM and HERSEY. *The Gaslight and Coke Company, Bromley-by-Bow, E., June 2, 1879.*

Gentlemen,—I have much pleasure in stating that the results of the working of Kirkham, Hulett, and Chandler's Washer-Scrubber, erected at these works in 1877, have been perfectly satisfactory, and that the two erected last year are doing well—all that you guaranteed; indeed, the effectiveness of the machine is so convincing, that I am induced to recommend another being ordered if you can undertake to have it erected complete before next winter. (Signed) W. B. WRIGHT, Engineer.

Messrs. KIRKHAM and HERSEY. *Phœnix Gaslight and Coke Company, Office, Greenwich, S.E., Aug. 12, 1879.*

Gentlemen,—In reply to your inquiry, one of your Patent Scrubber-Washers to purify 100,000 cubic feet per hour was put into operation at these works on the 1st of June. At the same moment the whole of our Scrubbers, equal to 28,000 cubic feet, were thrown out of use, leaving your Washer the whole work of freeing the gas from Ammonia. This it has done to perfection up to date. With 10 gallons of water to each ton of coal carbonized passing through it we get a clean test at the seventh chamber, leaving four chambers margin for extra work. The mean quantity of Ammonia in the inlet (fixed and free) obtained from a large number of tests was 241 grains per 100 feet of gas. On the outlet—Free Ammonia—Nil. The quantity of water used is 10 gallons per ton of coal carbonized. The strength of liquor as follows:—

Chamber No.	1	2	3	4	5	6	7	8	9	10	11
Strength of liquor—ounces	Nil.	Nil.	Nil.	Nil.	0·4	1·0	2·2	3·5	5·5	8·25	12·5

We are working five revolutions per minute. It takes out all the free Ammonia, reduces the carbonic acid and sulphuretted hydrogen 30 per cent., requires a very small amount of power to drive, and altogether is, in my opinion, the best machine for the purpose yet invented, and will, I feel confident, ere long, entirely supersede the Scrubbers of to-day. I am glad to find you are going to fix one of these Washers at our Vauxhall works. (Signed) P. J. WATES, Engineer.

For Results and other Testimonials, see next week's Journal.

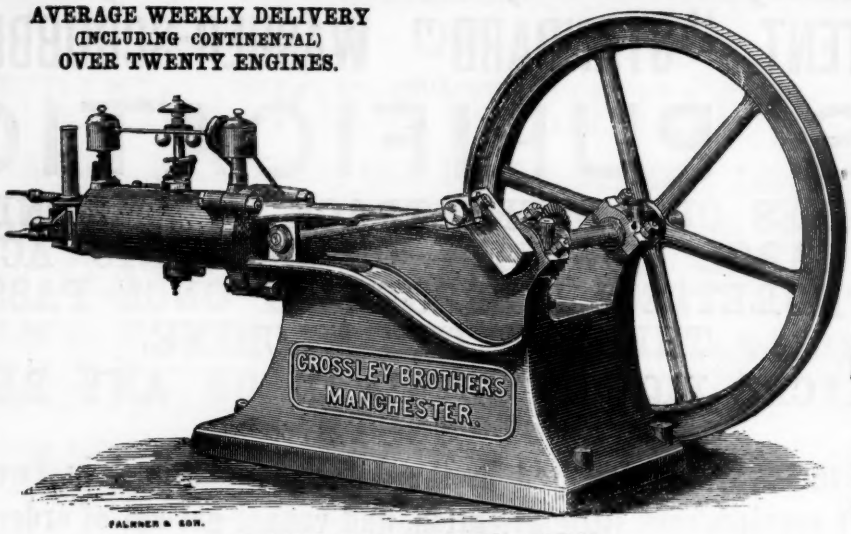
FOR FURTHER PARTICULARS AND TESTIMONIALS, ADDRESS MESSRS.

KIRKHAM, HULETT, & CHANDLER, LIMITED, { 59 & 60, Palace Chambers, Bridge St., Westminster, London, S.W.

AN ENGINE WHICH WORKS WITHOUT A BOILER OR STEAM

AVERAGE WEEKLY DELIVERY
(INCLUDING CONTINENTAL)
OVER TWENTY ENGINES.

The durability of these Engines is now established by experience, one of them having run night and day at the Hinckley Gas-Works for over Twelve months without any expenditure for repair; this being equal to about 2½ years average work.



Over 1900 already delivered.

Very numerous Testimonials from Users, including Engineers, Men of Science, and others, on application to the makers.

No trouble with Coal, Ashes, Smoke, Insurance, Water, or constant attendance.

No Glands to pack, or Water Gauges and Steam Gauges to watch.

STARTS AT A MOMENT'S NOTICE.

THE "OTTO" SILENT GAS-ENGINE.

(Otto and Crossley's Patents, 1876 and 1877.)

THEY ARE USED FOR ALL KINDS OF PURPOSES, CHIEFLY FOR EXHAUSTERS, SCRUBBERS, & PUMPS.

DELIVERED IN MANCHESTER. SIZES { NOMINAL HORSE POWER ½ 1 2 3½ 6 8 12 16 / MAXIMUM HORSE POWER ¾ 1½ 2½ 4 9 12 18 24 } OFFERED. CASES NOT CHARGED IF RETURNED FREE.

PRICES INCLUDE CAST-IRON STAND, TURNED FLY-WHEEL, AND DRIVING PULLEY; WATER-VESSEL, SEVERAL DUPLICATES, AND GAS-FITTINGS (EXCEPTING METER AND PIPES).

WORKS AND HEAD OFFICES:
Gt. Marlbro' St., Gloster St.

CROSSLEY BROTHERS,
MANCHESTER.

LONDON HOUSE:
116, Queen Victoria St., E.C.

GAS COAL. GAS COAL. GAS COAL.

WELLS, BIRCH, RYDE, and CO., Limited,

HOYLAND SILKSTONE COLLIERIES,

Near BARNSLEY.

This Company is now in a position to raise 2000 tons per day of REAL OLD SILKSTONE GAS COAL.

"The quality of this Coal for Gas purposes, if equalled, is not excelled by any on record, and the Coke competes successfully with best Durham."—See *Mining Journal*, Aug. 11, 1877.

Prices quoted to any Railway Station, or F.O.B. Hull, Grimsby, Goole, Keadby, Liverpool, and Fleetwood.

Full particulars will be sent on application to above address.

GOLDSMITH'S PATENT SIGHT WATER-LINE INDICATING GAS-METER.

MANUFACTURED BY GUEST AND CHRIMES,

FOUNDRY AND GENERAL BRASS WORKS,
ROTHERHAM;
AND 85, SOUTHWARK ST., LONDON, S.E.

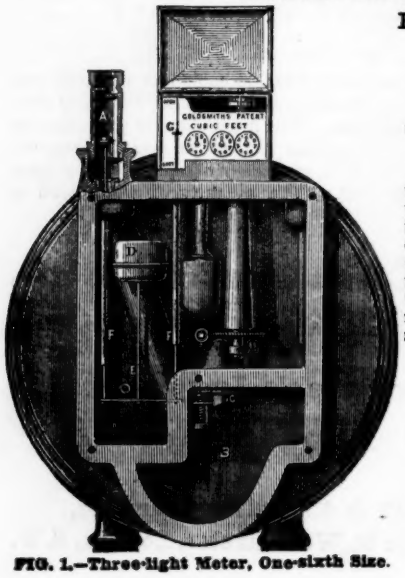


FIG. 1.—Three-light Meter, One-sixth Size.

Fig. 1 is a Meter with front removed to show the arrangement and connection of the Indicator and Valve.

Fig. 2 is front view of Index, with cover up.

The principal object of this invention is to render the water-line in the reservoir at all times visible. It will be seen, by reference to the illustrations, that this is accomplished in the following manner:—On the dial are the words "Open" and "Shut," and attached to the float is the pointer G, which rises and falls with the water-line in the reservoir. If the pointer is at "Open," it shows that the valve is open, and that the reservoir is full. If it is at "Shut," it shows that the reservoir is empty, and that the gas will be shut off.

The following ADVANTAGES will be obvious:—

1. The Inspector can see at a glance if the Meter requires water.
2. No more water than is required need be added, and therefore no water has to run out.
3. The Meter Inspector will be spared a great deal of his most objectionable work, and he will save a great deal of time and trouble.
4. The consumer will not always have to be asked for water, nor will he have to endure the unpleasant smell caused by waste water being run out.

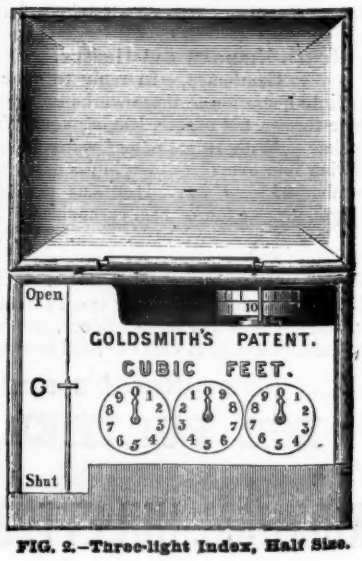
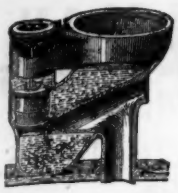


FIG. 2.—Three-light Index, Half Size.



SMEATON'S TRAPLESS CLOSETS.

MESSRS. W. SMEATON & SONS,
HOT WATER AND SANITARY ENGINEERS.

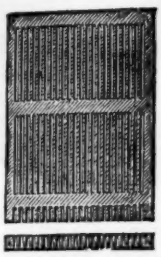
PATENTEES AND INVENTORS OF THE
TRAPLESS, THE D TRAP, AND EDDYSTONE CLOSETS.
Also the New
ECLIPSE COMBINATION CAST LEAD TRAP.

The Price will be half of the old-fashioned D Trap, it being cast all in lead, without a Joint. Send at once for an Illustrated Price List to their Wholesale and Retail Agent,

G. R. GLENIE,
WALBROOK HOUSE, 37, WALBROOK, LONDON, E.C.

A large Discount to the Trade and Shippers. Estimates Given and Contracts Taken.

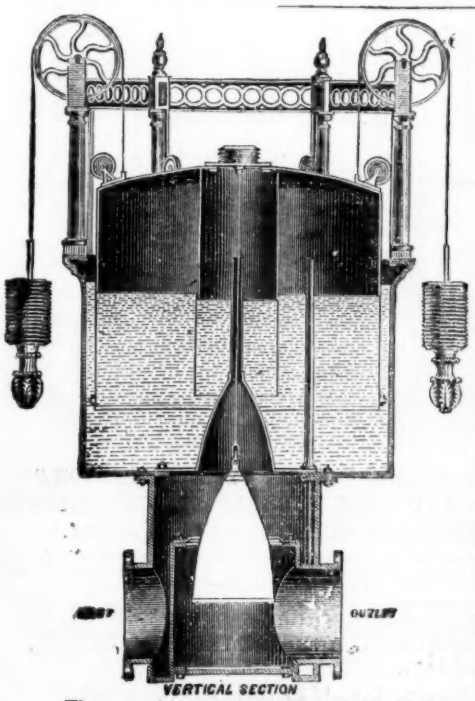
R. DEMPSTER AND SON'S
WOOD SIEVES FOR PURIFIERS,



WITH TAPER OR PARALLEL BARS,
MADE BY SPECIAL MACHINERY.
SCRUBBERS FILLED WITH BOARDS,
On our approved principle, for the extraction of Ammonia.
Prices on application. References to First-Class Engineers.
ROSE MOUNT IRON-WORKS,
ELLAND, Near HALIFAX.
London Offices: 2, SUFFOLK LANE, CANNON STREET, E.C.

J. & J. BRADDOCK,
GLOBE METER-WORKS, OLDHAM,
MANUFACTURERS OF
WET AND DRY CONSUMERS GAS-METERS,
OF THE HIGHEST EXCELLENCE ONLY;
ROUND STATION-METERS,
ON CAST-IRON STANDS;
SQUARE STATION-METERS,
WITH PLANED JOINTS.

Messrs. Braddock beg to submit to Gas Engineers their
PATENT COMPENSATING GAS GOVERNOR,
Which is designed to give an uniform pressure at the Outlet to the Main at all draughts up to the full quantities which the Governors are made to control, such outlet pressure being less than the initial pressure.



The uniformity of pressure is obtained by introducing a compensating chamber into the Bell or Holder of the Governor, which compensator is of the same area as the valve, both of which are operated on by the initial pressure, thereby placing the valve in equilibrium, no matter what the initial pressure may be. The action on the Bell is by the Gas passing along a pipe from the outlet, and the pressure is regulated by weights in connexion with the Bell as required.

From the sectional elevation attached hereto, it will be seen that only the Gas required to operate the Bell comes in contact with the water of the tank, which water will remain comparatively sweet and free from odour. That in case of accident to the Bell, no more Gas can escape than would pass up the pipe covering the valve-rod and Bell supply-pipe.

These Governors have been made and sent out of various sizes for from 2 to 30-inch Mains, and give most satisfactory results.

They can be made with Float in the Bell, or counterpoise as per section.

C. & W. WALKER'S
WOOD PURIFIER SIEVES,
Which have now been used for fifteen years, and their advantages and durability fully established. They are made entirely by steam machinery in very large quantities at the most moderate cost.

MIDLAND IRON-WORKS,
DONNINGTON, Near NEWPORT, SHROPSHIRE.
FINSBURY CIRCUS, LONDON.

MOBBERLEY & PERRY,
FIRE CLAY and BRICK WORKS,
STOURBRIDGE.
Proprietors of
BEST GLASS-HOUSE POT and CRUCIBLE CLAY.
Manufacturers for Home and Export.
GAS-RETORTS, GLASS-HOUSE FURNACE,
BLAST-FURNACE, TANK BRICKS, LUMPS, TILES,
And Every Description of Best Fire-Bricks.

TROTTER, HAINES, & CORBETT,
BRETTELL'S ESTATE
FIRE CLAY & BRICK WORKS,
STOURBRIDGE.
Manufacturers of GAS-RETORTS, GLASS-HOUSE FURNACE & BLAST-FURNACE BRICKS LUMPS, TILES, and every description of FIRE-BRICK.
Proprietors of
BEST GLASS-HOUSE POT and CRUCIBLE CLAYS.
Shipments Promptly and Carefully Executed.

ESTABLISHED IN 1860.
BENJAMIN CARPENTER,
THE ORIGINAL MANUFACTURER OF THE IMPROVED
WOOD SIEVES
FOR
GAS PURIFIERS & SCRUBBERS.
PROVIDENCE WORKS,
22, HERMES STREET, PENTONVILLE ROAD,
LONDON, N.

The Dunston Engine Works Co.,
GATESHEAD-UPON-TYNE.
Are the Sole Manufacturers of
Archer's Patent Hoists,
ALSO OF
Archer's Patent Stone Breaker,
AND OF
Archer's Patent Ore Crusher & Pulveriser,
The last-named Machine (without the Pulveriser) makes the best and most durable Coke Breaker.

GEORGE'S
Patent Gas Calorigen,
A STOVE FOR
WARMING AND VENTILATING.
Recommended by Dr. Richardson.
Manufacturers:
J. F. FARWIG & CO.,
36, QUEEN STREET, CANNON ST., LONDON.

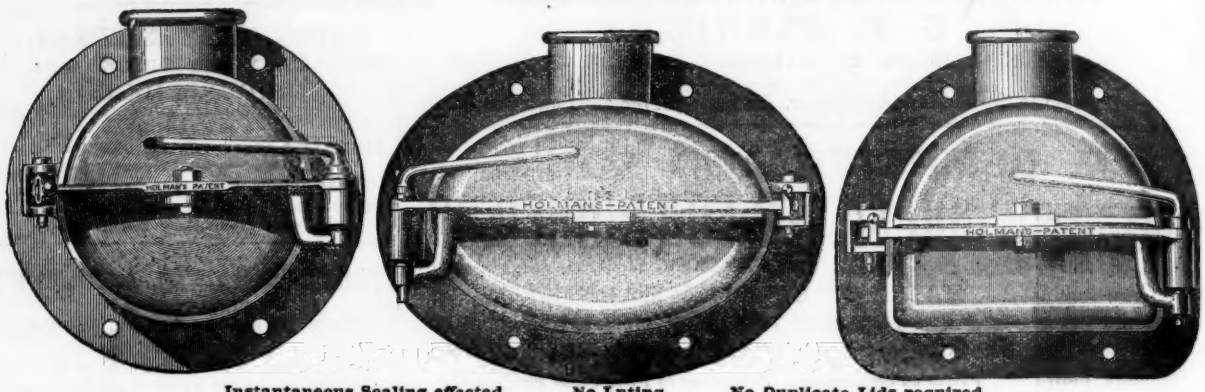
Gold Medal Awarded, Paris Exhibition, 1878.
THOMAS TURTON AND SONS,
SHEAF AND SPRING WORKS,
SHEFFIELD,
MANUFACTURERS OF
FILES OF BEST QUALITY
FOR ENGINEERS,
STEEL OF ALL DESCRIPTIONS,
SCREW STOCKS, TAPS, AND DIES, SPANNERS,
RATCHET BRACES, LIFTING-JACKS,
ANVILS, VICES,
AND ENGINEERS TOOLS GENERALLY.
LONDON OFFICE:
9 2, CANNON STREET, E.C.

TANGYE BROTHERS AND HOLMAN,

CORNWALL HOUSE, QUEEN VICTORIA STREET, LONDON, E.C.

SOLE MAKERS OF MORTON'S PATENT SELF-SEALING RETORT-LIDS,

WITH HOLMAN'S PATENT ECCENTRIC FASTENINGS,
Anti-Friction Catches, and Self-Sustaining Cross-Bars.



Instantaneous Sealing effected. No Luting. No Duplicate Lids required.
Holman's New Self-Sustaining Cross-Bar ensures freedom of Joint, and maintains parallel position of the Lids.

Morton's Patent Retort-Lids are in use in nearly all the Principal Gas-Works in the United Kingdom and the Colonies; also on the Continent and in the United States of America. They are now made of the

SAME FORM OR SECTION AS THE RETORT. (See Illustrations above.)

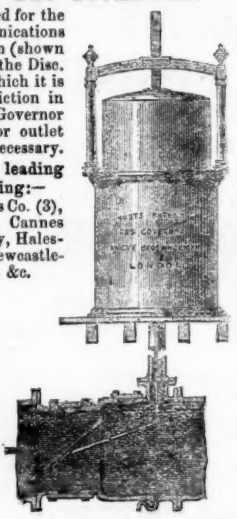
Engineers preparing Specifications of New Works will be furnished with Dimensions of Stock Patterns, together with Approximate Weight and other data on application.

HUNT'S
EQUILIBRIUM DIRECT-MAIN GAS GOVERNOR.

In this Governor a Throttle-Valve is substituted for the ordinary suspended Cone, all external communications being avoided by placing the Lever or Radius Arm (shown in the drawing) inside the Valve-Chamber upon the Disc. The Disc is carried upon steel centres, upon which it is accurately balanced and turns freely. The friction in working is thereby reduced to a minimum. This Governor is extremely sensitive to alterations of inlet or outlet pressure, and renders a large actuating holder unnecessary.

These Governors have been adopted by many leading Gas Companies, among whom are the following:—

The Gaslight & Coke Co. (19), The London Gas Co. (3), and at Abergavenny, Arundel, Birmingham, Cannes (France), Devonport, Dursley, Exeter, Guernsey, Halesowen, Leicester, Mentone (France), Monmouth, Newcastle-on-Tyne, Oxford, Plymouth, Rochdale, Windsor, &c.



TESTIMONIAL.

The Gaslight and Coke Company,
9, Water Street, New Bridge Street,
Blackfriars, E.C., Feb. 27, 1875.

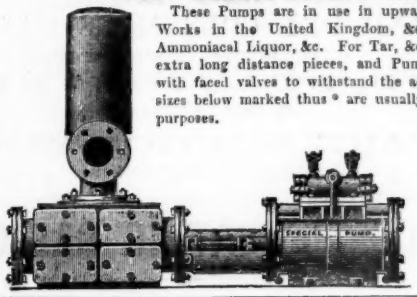
MESSRS. TANGYE BROTHERS AND HOLMAN.

Gentlemen,—The two 24-inch and three 36-inch Hunt's Equilibrium Governors supplied by you, and fixed in the valve-rooms at Whitechapel, Goswell Road, and Blackfriars, are working very satisfactorily.

Yours truly,
(Signed) JOHN JOHNSON.

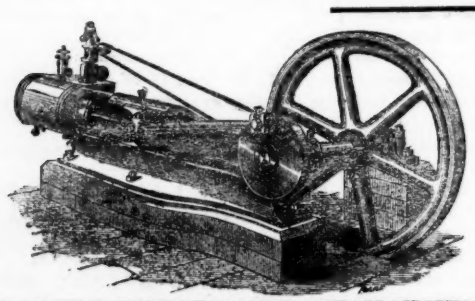
THE
"SPECIAL" DIRECT-ACTING STEAM-PUMP.

These Pumps are in use in upwards of one hundred Gas-Works in the United Kingdom, &c., pumping Water, Tar, Ammoniacal Liquor, &c. For Tar, &c., they are provided with extra long distance pieces, and Pumps are entirely of iron, with faced valves to withstand the action of the liquid. The sizes below marked thus * are usually kept in stock for these purposes.



The quantities delivered of Tar should be taken about two-thirds that of water.

Diameter of Steam Cylndr.	Diameter of Water Cylndr.	Length of Stroke.	Gals. of Water per Hour, Approx.	Prices for Water.	Prices for Tar and Ammoniacal Liqr.
*3 in.	1½ in.	9 in.	450	£16 0 0	£17 0 0
*4 ,,	2 ,,	9 ,,	815	18 0 0	19 0 0
*5 ,,	2½ ,,	12 ,,	1,250	21 0 0	22 10 0
*5 ,,	3 ,,	12 ,,	1,830	22 10 0	24 0 0
*6 ,,	3 ,,	12 ,,	1,830	25 0 0	26 10 0
*6 ,,	4 ,,	12 ,,	3,250	30 0 0	31 10 0
6 ,,	5 ,,	12 ,,	5,070	35 0 0	36 10 0
*7 ,,	5 ,,	12 ,,	5,070	40 0 0	41 10 0
7 ,,	6 ,,	12 ,,	7,330	45 0 0	46 10 0
*8 ,,	6 ,,	12 ,,	7,330	50 0 0	52 0 0
10 ,,	6 ,,	12 ,,	7,330	60 0 0	62 10 0
10 ,,	8 ,,	12 ,,	13,000	75 0 0	77 10 0

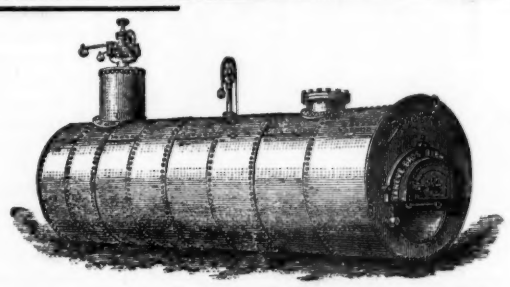


TANGYE'S HIGH-PRESSURE STEAM-ENGINE,
NEARLY 4000 IN USE.

The Design, Workmanship, and low prices of these Engines have called forth universal approval.

Nom. H.P.	2	3	4	6	8	10	12	14	20	25
	£28	£37	£44	£68	£86	£111	£122	£133	£185	£215

Including Governor and Feed Pump. Variable Expansion extra.



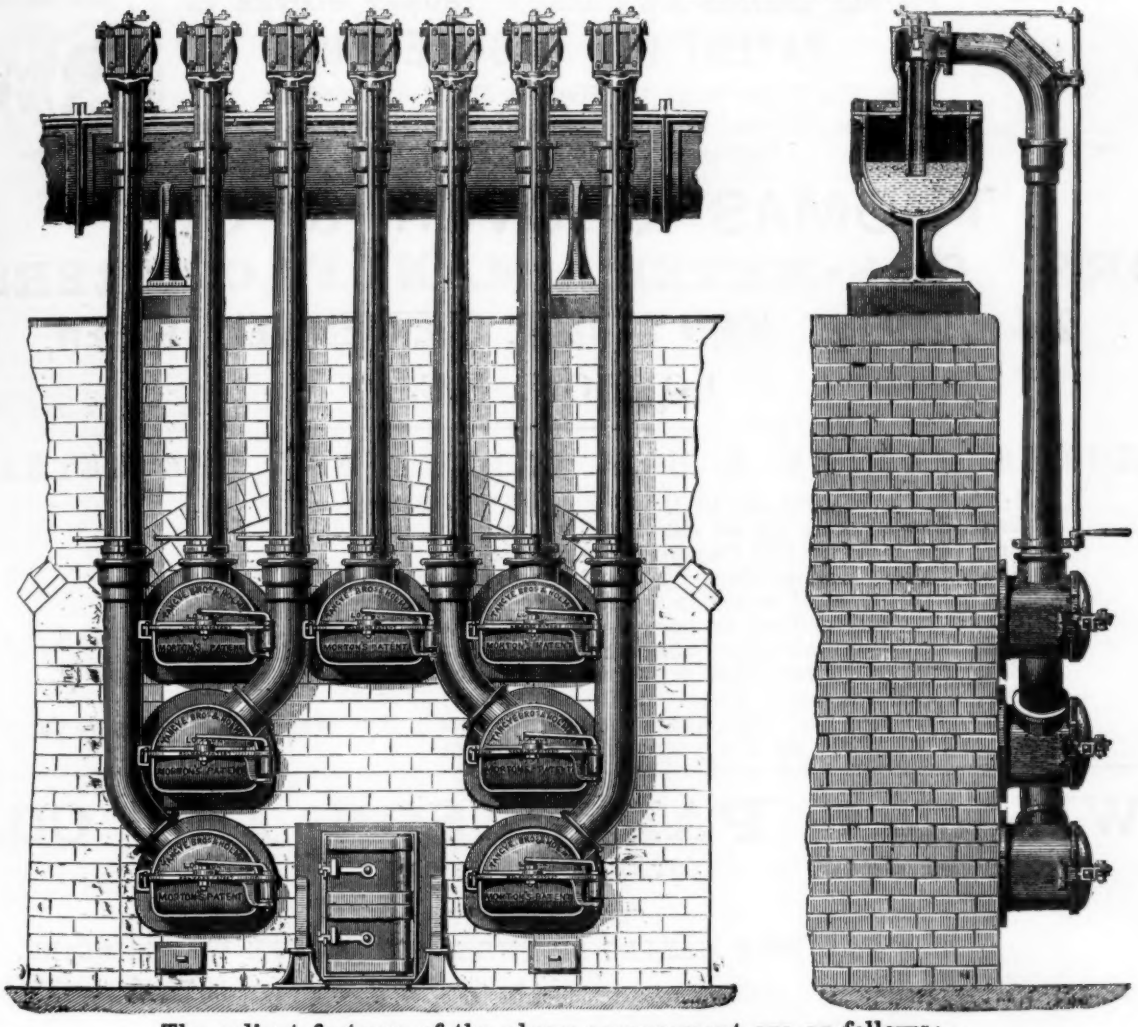
CORNISH, LANCASHIRE, "THE KESTERTON," VERTICAL, AND MULTITUBULAR STEAM-BOILERS OF SUPERIOR QUALITY ALWAYS IN STOCK.

This Department having been greatly extended and furnished with the most approved Boiler-making Machinery and Tools, T. B. & H. are prepared to supply all kinds of Steam-Boilers with great facility at lowest current prices.

Also Makers of IMPROVED HYDRAULIC HOISTS, TRAVELLERS, CRABS, CRANES, PULLEY BLOCKS, HYDRAULIC AND SCREW LIFTING JACKS, LATHES, PUNCHING AND SHEARING MACHINES, And all other Descriptions of Tools, &c.

FULL PARTICULARS, ESTIMATES, CATALOGUES, &c., ON APPLICATION.

HOLMAN'S PATENT
NON-PRESSURE VALVULAR SEAL-PIPES
FOR
HYDRAULIC MAINS.



The salient features of the above arrangement are as follows:—

1. The Seal is instantaneously opened and closed from the stage by the stokers.
2. There are only two positions for the actuating lever: one when the Seal is opened during the period of carbonization, the other when it is closed for drawing and charging the retort.
3. The retort can never be blocked, because the port directing the gas *through* the Seal is always opened, and the port permitting the gas to *pass* the Seal *direct* into the hydraulic main is also open while the retort is at work.
4. The manager and stokers can always see at a glance, by the position of the lever, whether the retort is duly unsealed while carbonizing its charge.
5. There are no extraneous seals, stuffing-boxes, hinges, screws, chains, pulleys, springs, teeth, or other complication belonging to the valves; they are made plain and strong for rough use, and will last many years without renewal.
6. The valve faces are always covered and never separated, hence no foreign matter can put them out of action.
7. They are positive, reliable, interchangeable, free from all the uncertainty of automatic arrangements, and low in price.
8. No extra pipes or connections are required, because the Valvular Seal-pipe is self-contained in the single branch of the ascension-pipe, which stands on the hydraulic main, and is easily accessible by removing an ordinary cover secured by two bolts only.

(238) TWO HUNDRED AND THIRTY-EIGHT HOLMAN'S PATENT VALVULAR SEAL-PIPES are being fitted to the Hydraulic Mains at the Radford Station of the Corporation Gas-Works at Nottingham.

(84) EIGHTY-FOUR more are being fitted to the Mains in the New Retort-House of the Gas-Works at Brentford, and they can be readily applied to existing Hydraulic Mains generally.

They are to be fitted to the Hydraulic Mains of the New Retort-House at the LONDON GAS-WORKS, and at other large stations.

Mr. MORTON writes in the following terms, under date of Feb. 3, 1880:—

"Gentlemen,—I have determined to use your HOLMAN'S PATENT NON-PRESSURE VALVULAR SEAL-PIPES in our new Retort-House. Will you, in the meantime, send me, as soon as you can, four as you are now making them. I expect to hear of a large demand for these Pipes. I like the idea of always maintaining a passage through an ordinary dip."

ESTIMATES for Retort Work, including Mouthpieces fitted with Morton's Patent Self-Sealing Lids and Holman's Self-Sustaining Cross-Bars and Fastenings, Hydraulic Mains and Ascension-Pipes, fitted with Holman's Patent Non-Pressure Valvular Seal-Pipes complete (as per accompanying illustration), will be forwarded to Engineers on receipt of particulars of intended erections, or re-setting of Retorts during the current or ensuing season.

Engineers preparing Specifications will be furnished with Tracings and all necessary data on application.

Sole Makers:

TANGYE BROTHERS AND HOLMAN,
HYDRAULIC AND GAS ENGINEERS,
CORNWALL HOUSE, QUEEN VICTORIA STREET, LONDON, E.C.

London, 1851 New York, 1853. Paris, 1855. London, 1862.

Dublin, 1865.

The SIX MEDALS AWARDED to THOMAS GLOVER for

PATENT DRY GAS-METERS,

The latter being the Highest Medal awarded for Dry Gas-Meters by the Imperial Commissioners for the Universal Exhibition, Paris, 1867.

Paris, 1867.

THOMAS GLOVER & CO.,

DRY GAS-METER MANUFACTURERS,

214 TO 222, ST. JOHN STREET, CLERKENWELL GREEN,

LONDON, E.C.

THOMAS GLOVER & CO.'S PATENT DRY GAS-METERS.

1st, Are a remedy for all the defects of Wet Meters;
2nd, Are suitable for all climates, whether hot or cold;
3rd, Incur no loss of Gas by evaporation;
4th, Cannot become fixed by frost, however severe;
5th, Are the most accurate and unvarying measurers of Gas;
6th, Prevent jumping or unexpected extinction of the Lights;
7th, May be fixed either above or below the level of the Lights;
8th, Cannot be tampered with, without visibly damaging the outer case;
9th, Will last much longer than Wet Meters;
10th, Will not cost more than one-half for repair that Wet or Water Meters do;
Are upheld for five years without charge.

WILLIAM PARKINSON AND CO.

(ESTABLISHED 1816.)

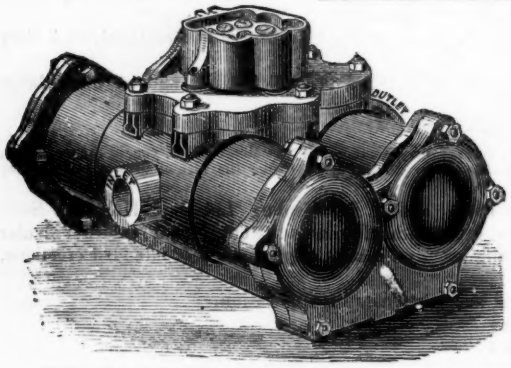
SOLE MAKERS OF THE LOW-PRESSURE WATER-METER.

This Meter will register with perfect accuracy, either at full speed, or with a few drops only passing through it.

It must be placed over the cistern to be supplied, and the water, after being measured, will fall from the outlet into the cistern below.

Each Meter is fitted with a ball-valve, so made that it can be adjusted to shut off the supply at the inlet when the water reaches any required height in the cistern.

The 100-gallon Meter is fitted with a cistern holding about three or four gallons, and may be fixed inside a house, free from the effects of frost, and requires no attention after once being fixed.



HIGH-PRESSURE WATER-METER.

The Union Water-Meter, of which an external view is here given, is of the positive class—*i.e.*, a Meter in which a measuring chamber is alternately filled and emptied, each filling being duly recorded. It is formed of two cylinders, with double pistons in each, having a rotary-valve of peculiar construction, which is worked from cams on the piston-rods.

It is claimed for this Meter, among its advantages over other Piston Meters in use, that it is extremely small and compact, and that its durability and accuracy have been proved by the fact that upwards of 20,000 of them, of various sizes, are in successful operation in the States. In England the instrument has been fully tested by several Water Engineers of eminence, and pronounced by them as a reliable and satisfactory register of water supply; it is also economical in cost.

ALL METERS are TESTED with 60 lbs. pressure before they are sent out.

COTTAGE LANE, CITY ROAD, LONDON, E.C.

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TO CORRESPONDENTS.

W. E. S.—*If it is a meter stamped in accordance with the Sale of Gas Act, 1859, you can proceed against a person doing as you describe with it. The 15th clause of the Act says: "Any person who shall . . . . knowingly tamper with or do any other act in relation to any stamped meter . . . . shall on conviction forfeit a sum not exceeding five pounds, pay the fees for removing and testing, and the expense of purchasing and fixing a new meter: Provided that the payment of any such penalty as aforesaid shall not exempt the person paying from liability to indictment or other proceeding at law to which he would otherwise be liable, or deprive any person of the right to recover damages against such person for any loss or injury sustained by such act or default." We shall be glad of further particulars of the case.*

THE JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, MARCH 30, 1880.

Circular to Gas Companies.

THE Metropolitan Board of Works last Wednesday decided to continue the experiment of illuminating the Thames Embankment and Waterloo Bridge by means of the electric light, for another twelve months from the 10th of April, at the rate of twopence halfpenny per lamp per hour. At this stage of the experiment it can hardly be said who are the sufferers. Most certainly, to our knowledge, the Metropolitan Board of Works are not, as the lamps are lighted for an extremely small sum. We should like to know what the Société Générale d'Electricité expect to make in profits. What they have spent on the experiments upon the Thames Embankment, &c., &c., the report of the Board's Engineer and their Chemist fails to inform us. Twopence halfpenny per lamp per hour appears an exceedingly small remuneration, considering the work, and without knowing the details of the business of the Société Générale, we may make a guess that it does not pay, except as an advertisement. It is admitted that, as at present arranged, electricity has a small advantage over gas, light for light being considered. For instance, it is calculated by the Officers of the Metropolitan Board that, at the present rate of charge, for thirty-four pence the light of 2720 candles can be obtained by means of gas, and rather more than 3000 candles of light by means of electricity. This gain is not great, and considering the difficulties and risks which have to be overcome in furnishing the electric light, the general introduction of it into our streets does not seem at all desirable. Gas still holds its pre-eminence, and even where the electric light is used, gas is also employed. The varying seasons will, of course, make a difference. As the bright summer nights come on, very little artificial illumination will be required. Electricity may furnish the most of this on the Thames Embankment and Waterloo Bridge; still the employment of gas is inevitable.

The use of the electric light is certainly extending over the world. In most European, and even in some Asiatic cities it is now employed. It illuminates a palace in Bombay, without, we may guess, any detriment to the Bombay Gas Company. It is also reported that it is to be used in the palace of the Shah of Persia, at Teheran, in which city, so far as we know, no gas-works exist. At how many *tomans* per hour the light is to be supplied in Teheran we cannot say, but we readily suppose that it could be furnished at a cheaper rate than the oil lamps which it would supersede. It has, however, to be taken into consideration that at Teheran it will be necessary to use a steam-engine to drive a Gramme machine, and there probably it will not be found particularly cheap; but what does that matter to a Shah with numbers of diamonds, but scarcely any money in his treasury? Still the fact is patent that the use of the electric light is spreading. It has reached as far as Burmah, where, by its aid, the King now lights his palace at Mandalay. Close by, however, is a supply of rich bituminous coal, which is, no doubt, admirably suited for gas-making; but no enterprising individual seems to have sought a concession to light Mandalay with gas. The fact is lives are held cheap in Burmah, and the enterprising concessionaire might find himself in singular difficulties as soon as his works were established and in action. All this, however, is nothing to us. We look over England, Scotland, and Ireland, and see no indication of any great spread of electric illumination. The experiments on the Thames Embankment and Waterloo Bridge are the only ones of any magnitude now being made; but here, too, we find some differences of opinion, as the Vestry of St. Martin's-in-the-Fields refused permission for the illumination of Northumberland Avenue by means of the electric light. The Metropolitan District Railway have discontinued its use at Victoria Station, and the Corporation of the City of London seem now to ignore its existence; so we cannot regard the prospects of the light as of a brilliant character.

The ordinary half-yearly meeting of the Proprietors of the Commercial Gas Company is to be held next Friday, when the Directors will recommend the payment of dividends for the six months to Dec. 31 last at the rate of eleven and a quarter per cent. per annum on the old stock, and eight and a quarter per cent. on the new stock, both less income-tax. These dividends, it may be observed, are a quarter per cent. more than was paid the previous half year, and three-quarters per cent. more than this time twelve months ago. As the Company have, since Midsummer last, been charging only 3s. 3d. per thousand feet for gas, instead of 3s. 5d. as formerly—their standard price, under the sliding scale, being 3s. 9d.—the Directors could have recommended another quarter per cent. additional dividend; but have wisely resolved to add to the reserve-fund instead, to place £6200 to the insurance-fund, and carry over £3445 to the present half year's accounts. Like most other Gas Companies, the Commercial Company have gone forward with great strides in their make of gas, as compared with even a year ago. For the last six months of 1878 the quantity of gas they manufactured was a trifle more than 719 millions; for the first half of 1879 it was 740 millions; while for the past six months it reached nearly 768 millions. The revenue from the sale of gas for the two half years 1878-79 was £115,064 and £115,970 respectively; and last half year—notwithstanding, as before stated, the reduction of twopence per thousand feet, which came into operation on July 1—the receipts from gas sold advanced to £117,103. Very slight improvement is, however, manifested in the total value of residuals over the corresponding half of last year—coke and breeze produced only £18,144, as against £20,990; but, on the other hand, tar is credited with £6036, and ammoniacal liquor with £8412, against £4374 and £6344 respectively. Consequently, an advance in this branch of the Company's business is shown of close upon £1000. Nothing noteworthy appears on the debit side of the revenue account, the slight additions in many of the items being fully justified by the larger quantity of gas made. The amount carried to net revenue account, being the profit for the past six months, is £45,820, or nearly £2000 more than for the second half of 1878. No additions were made to the capital account of the Company according to the statement now before us; but the Directors, in their report, say, that in order to provide for the increasing demand for gas, they have entered into contracts for the construction of a new tank, and the erection of a new holder at their Poplar works. More capital being needed to carry out these extensions, the Directors intend applying to the Shareholders on Friday for their authority to raise

£60,000 by the issue of stock under the powers of the Company's Act of 1875.

The report of the Directors and the accounts of the London Gaslight Company have also been issued in anticipation of the half-yearly meeting to be held on the 7th prox. The report shows a very satisfactory and highly-gratifying state of affairs. After providing for all preferential charges, there remains a sum of £24,979, out of which the Directors recommend a dividend of ten per cent. on the ordinary capital. The report further states that the Bill promoted by the Company has reached its second reading in the House of Commons, and at this stage it will be taken up in the new Parliament. This Bill, as our readers know, is to enable the Company to apply £20,000 of capital for the supply of fittings, stoves, &c. This appropriation will be appreciated by all who can participate in the London Company's proposed arrangements. The importance of the superintendence of responsible officials over all the fittings supplied by Gas Companies can hardly be over-estimated; but there are some people who think that a Gas Company can push their authority too far in this way. Therefore it is the London Company do not seek any inquisitorial powers, further than to know that the apparatus on hire is being fairly used. But it must be well understood that the heating or cooking appliance in use is employed to increase the consumption of gas. The sole object the Company have in the promotion of this measure is to increase their sale of gas. They do not desire to make any profits whatever from the apparatus; but, as a matter of course, they will use their utmost endeavours to increase the consumption of gas, and in this way add to revenue. In the past half year the sum of £121,125 was received by the Company for gas sold and for meter-rents; but in future half years we anticipate much larger receipts under this head. The profit applicable to dividend is, as will be seen above, high, and it is explained in the Directors report that this result was owing to the low price of coal. This is a dangerous admission, which the enemies of the Company are sure to seize upon. If, they will say, cheap coal gives large profits to the Company, it should equally lead to a reduced price for gas. The charge made by the London Company for their gas is but small, considering the areas supplied. It might be smaller, if the Company would take our advice, and join in the combinations which are now almost perfect. Why, for example, should a small district round the Elephant and Castle be supplied for 3s. 3d. per thousand feet, when a neighbouring Company can supply it for 3s.? The two districts might well be combined, with equal advantage to the Shareholders of the Companies and the consumers in the districts. Again, it would be of great importance if the south-western district of the Company were annexed to the South Metropolitan combination. The north-western section would fall by natural selection into the hands of the Chartered Company, by whom the price and quality of the gas would soon be brought to modern standards. Further, the great aim of the Metropolitan Companies should be to be joined together, and bring the price of gas uniform all over the Metropolis. If the Water Companies had united, as we have always advised them to do, they would not be in the precarious position in which they now find themselves.

The ordinary half-yearly meeting of the Crystal Palace District Gas Company was held on the 25th inst., and, of course, passed off very pleasantly. With full dividends and a good balance, everybody ought to be well satisfied, and we believe that the Shareholders in the Company were well contented with the announcements made by the Chairman and Deputy-Chairman, and with the profits, which are probably by this time in their pockets. The success of this Company is remarkable. Starting in a sparsely-populated district, with, at the time, poor prospects, they have had the good sense to grow as the naked areas within their limits of supply are built over. There is a greater future in store for this Company, inasmuch as it is certain that further and more important building operations are imminent within their limits. Every shop and every good house built in the district adds to their profits; and inasmuch as acres upon acres of first-class building land must be filled up, a large increase in the consumption of gas is certain. Our anticipations, therefore, of the progress of the Company are fully justified.

The annual meeting of the Sheppy Gas Company was held on the 24th inst., when maximum dividends were declared on all classes of shares, and a bonus of one per cent. was paid in respect of dividends due for the year 1872. The Company are, as they should be, highly successful, and it has been found necessary to make additions to the works to provide for the increasing demands of the district supplied. Under the direction of Mr. A. W. Marks, the able Secretary of the Company, the supply of stoves, gas-fittings, &c., has been found extremely profitable. The trade account for the year shows that £7154 was received for gas; for stoves on hire and gas-fittings, £351; and residuals produced £1460—a very good result, considering the price of coal and the charge for gas. On the whole, the Sheppy Company are to be greatly complimented on the results of their past year's working, and they could hardly have a better balance-sheet to present to the Shareholders.

The South-West of England District Association of Gas Managers held a very successful and pleasant meeting at Taunton on the 9th inst. The address of the President, Mr. S. W. Durkin, of Southampton, treated *de omnibus rebus et quibusdam aliis* in respect to gas matters. He began by remarking very properly that the profits of a Gas Company were not made in the board-room, where little else than talk goes on. It is commonly said that the profits are made in the retort-house; but wherever they are made, it depends on the Manager's assiduity. Of course, the influence which a Manager can exercise ceases at the consumer's meter, unless, indeed, special powers are conferred on the Company for the supervision of fittings. We may stop here for a moment to express a hope that in all future Gas Acts powers will be obtained by Companies to sell all kinds of gas-fittings, and to exercise a vigilant control over their use.

Mr. Durkin dealt carefully with the subject of carbonization and recent inventions. This matter was ably treated of at a subsequent stage of the meeting in a paper by Mr. Edwards, of Taunton, who gave an excellent account of the best methods of carbonization. We can express a tolerably full concurrence in all that was said on the subject by this gentleman. In so far as the selection of coals is concerned, we quite agree with him that the test of their goodness is a large experiment in the works of the Company, where alone a full knowledge of their value is to be obtained. He is quite right in rejecting any experiments made at other works, for scarcely two Managers agree in their workings, and, what is worse, the retort-settings vary in almost every case. Those proposed by Mr. Edwards we regard as excellent, and we hope that the system which he suggests will find a ready adoption. With payment by results we, of course, perfectly agree; but we doubt whether it would command respect in all quarters. Managers and stokers alike prefer a certainty; but, whether the gas produced be little or great, it is open to them to say that neither the success nor the failure is the consequence of their efforts, or their neglect. Nevertheless, we regard the system, as a system, as excellent, and should be glad to see it generally adopted. As for the abolition of the hydraulic main, that may happen by-and-by. The time has scarcely come for the demolition of this venerable relict of the oldest days of gas manufacture.

The vexed question of the best modes of purifying gas is not likely to be settled for years to come. For our own part, we have a preference for a combined washing and scrubbing, by means of which every trace of ammonia can be removed from the gas, and the greater part of the sulphuretted hydrogen taken out. It is idle, however, to say that the complete cleansing of gas can be effected in these vessels; it must go on to the open purifiers, in which, if the process be properly conducted, much more of what are commonly considered deleterious ingredients will be removed. Lime, if properly used, will take out a large portion of bisulphide of carbon, and so reduce the sulphur ingredient in gas, of which so much complaint is made.

It is, of course, the duty of every Gas Manager to promote, as far as lies in his power, the day consumption of gas, and this can be best effected by encouraging the use of gas stoves, cookers, &c. Mr. Hardick, of Salisbury, who contributed a paper on this topic, has been very successful in his endeavours to increase day consumption, by recommending the use of apparatus for cooking and warming. A like success, we are certain, will attend the efforts of any Manager who sets himself vigorously to work in this direction, and who is well supported by a liberal directorate.

The South-West of England Association of Gas Managers, therefore, may well be congratulated on the success of their recent meeting. We are happy to see these provincial societies making progress, for they do an amount of good which the present generation of Gas Managers are hardly in a position to appreciate.

SALE OF GAS AND WATER SHARES AT HARTLEPOOL.—On Thursday, the 25th inst., Mr. R. Merryweather sold by auction, at Hartlepool, 300 £10 shares in the Hartlepool Gas and Water Company. There was a most satisfactory bidding, the prices realized being from £12 14s. to £12 18s. per share, excepting the last lot of ten, which reached the high figure of £13 per share.

Water and Sanitary Notes.

Mr. Cross's Metropolis Water-Works Purchase Bill is not dead. It lies, for the moment, in a kind of trance, from which it will be roused shortly after the new Parliament meets. The opponents of the measure are numerous, but we fancy they will be reduced in number by a careful perusal of a letter which Mr. Edmund J. Smith, one of the valuators employed by Mr. Cross, last week addressed to *The Times*. In it he shows that the value of the Companies increases so rapidly that, if not purchased now, they will be lost for all time. It is something to learn that every year 20,000 new houses are built upon hitherto unoccupied ground in the Metropolis, within the area supplied by the Metropolitan Water Companies. No wonder that the incomes, and therefore the profits of the Companies, grow rapidly. There is here no necessity for resorting to the accusation that the Water Companies have greatly increased their rates. The fact is that, as we have said all along, in but few cases have charges been raised to the parliamentary standard. In the great majority of instances the Companies have charged very much less than the amount allowed by statute; and even in a case in which the progress of the Company has been most rapid, and the divisible profits have doubled in two years, maximum rates have not been charged. We have no doubt that this letter will go far to assure the general public, and reconcile many people to a purchase upon which they now look with something like alarm. The sum at which the Companies are valued does look enormous; but when it is remembered that no money will pass, and that the Water Trust will simply take over the Companies, giving in exchange for shares three and a half per cent. "water stock," and, further, that the business will continue just as usual, and that all the interest on the stock will be defrayed by the Trust, from the profits of the combined undertaking, there is really no cause for alarm. The income of the Trust will go on increasing just as that of the Companies has, and hence the solid value of the concern will be more and more established. It is consideration such as this which has so greatly raised the value of the Water Companies shares in view of their exchange for "water "stock." There can be no doubt that, under proper administration, the value of the undertakings must go on increasing. Much, however, will depend on the gentlemen chosen to fill the principal offices, and still more upon the Engineers who will be retained to carry on the undertakings. These will, of course, be selected from the present officers of the Companies, whose knowledge and experience will be absolutely necessary to the Trust; whereas the services of officers other than Engineers can be easily dispensed with. We shall look with much interest, supposing the Bill to pass, on the appointment of the Vice-Chairman of Works, for upon him the success of the scheme will mainly depend. There are among the Engineers of the Metropolitan Water Companies some gentlemen admirably suited to fill the post, and we hope the Government patronage will be so exercised that one of these will be placed in the position he will be so competent to occupy.

But we are writing as though the Bill had passed, while, in fact, it has a severe ordeal to go through. The Government—we are speculating that the present occupants of office will retain their positions—will, we know, subject the Bill to the fullest investigation it can possibly receive at the hands of a Hybrid Committee, whose recommendations will, of course, decide whether the Bill shall go on, or be altogether dropped. To this investigation we attach the utmost importance. Great as is the confidence we may place in the judgment of Mr. Cross and the calculations of his valuators, we are still uncertain as to how a Committee will regard the evidence which will be placed before them for and against the scheme. It may be that sufficiently good reasons will be put forward in support of Mr. Smith's view, that the value of the Companies increases at such a rate that now is the time for purchase, or never; but we must wait. Six weeks at least must elapse before we shall hear again of the Water Bill in Parliament. What will happen in the meantime few people know, and we, in these columns, dare not speculate on the probable course of events.

It is amusing, at the present conjuncture, to hear talk of a revival of the scheme for bringing a supply of water for London from the Cumberland and Westmoreland lakes. No engineering feat could be easier than to construct an aqueduct for this purpose, and hollow out reservoirs on all the elevated points around the Metropolis from which water at high pressure could be furnished. All this would be an extremely easy matter; it follows that it takes the popular fancy; and a large number of the inhabitants of the Metropolis are at this time longing for a supply of soft water from the Lakes. The cost of the works is modestly estimated at about £20,000,000; but then it is urged that a good deal of money may be earned by supplying towns along the line of the aqueduct. We may grant this, and accept the fact that the water has been brought to the Metropolis. But what preliminaries would have to be settled before this could be arranged? An Act of Parliament would, of course, be required; and it is certain that before water could, under such a scheme as this, be distributed in the Metropolis, the London Water Companies works would have to be bought up. Their value is set down at a sum of which our readers have already been informed. The execution of this scheme would cost another £25,000,000, so that we may say any change in the source of the water supply would double the cost of the undertakings. It is clear that, under these circumstances, the inhabitants of London must be content with a supply of what some people call "dirty" water. The Metropolis, rich as it is, cannot afford to wastefully expend money upon utopian schemes. We have around us plentiful supplies of pure water, and to these we must go when circumstances render it necessary.

The annual general meeting of the Bristol Water Company was held on the 20th inst. The Company is one of the few who pay maximum dividends. On this occasion they have been able to add a bonus of 2s. 6d. per share in liquidation of back dividends, and carry a balance of £319 to their reserve.

THE METROPOLITAN BOARD AND THE ELECTRIC LIGHT.

The decision of the Metropolitan Board, to extend the contract with the French Electrical Society for a period of twelve months, will be accepted as a matter of encouragement for the promoters of the electric light. The most noticeable feature is the reduction in price which accompanies this new contract. Latterly the price charged to the Board has been threepence per light per hour, and previously it was much higher. On the new contract the price is to be as low as twopence halfpenny. Fifty lamps are to be maintained, as now—namely, forty on the Victoria Embankment, between Blackfriars and Westminster, and ten upon Westminster Bridge. Fitted with the frosted globes, each of these gives the light of 265 candles, making, therefore, a total of 13,250 candles. At the reduced price, the fifty lamps will cost altogether 10s. 5d. per hour, which will be at the rate of ninepence halfpenny per thousand candles. If we reckon that five cubic feet of gas per hour produce the light of sixteen candles, and that the price of the gas is 3s. 4d. per thousand feet, we then find that to produce the light of one thousand candles we must burn 312 feet of gas per hour, costing one shilling and a halfpenny. At this rate the electric light on the Jablochkoff system would appear cheaper than gas in the proportion of something like ninepence to a shilling—a difference of twenty-five per cent. But we must look a little further to get at the practical bearing of this question.

The 50 Jablochkoff lamps supersede 255 gas-lamps, giving a collective light of 2720 candles. To obtain this amount of light, we must burn 850 cubic feet of gas per hour, costing 2s. 10d. But, as already stated, the 50 Jablochkoff lamps at 2½d. per hour each, will cost 10s. 5d., so that by employing the electric light instead of gas for the partial lighting of the Victoria Embankment, the expense is enhanced at the rate of 370 per cent. Those who know the locality, and who remember how the Embankment was lighted when the gaslights were all in use, may judge whether the lighting is any better now under the mixed system, or whether there is any gain at all commensurate with the expenditure of half a sovereign per hour instead of only half a crown. Photometrically, the light is increased fivefold; but, practically, there is perhaps scarcely any increase at all. No doubt much of the effect of the electric light is lost by the circumstance that the lamps throw half their rays on the river. But many of the gas-lamps were in the same predicament, so that this consideration affects both. That so much more light should be given to the Embankment, and yet that there should be so little practical advantage, is due to the high concentration of the electric light. Experience still favours the idea that electricity has a sphere distinct from that of gas. There is no need to create great gas-flames to compete with the electric light. Had the gas-lamps on the Embankment been doubled in number, the illumination would have been splendid, and the cost would have been a little less than 6s. per hour, instead of the half-guinea required for the electric light.

The Gas Companies may learn from this example wherein their real strength lies. It is not in the production of beacon lights, but in the multiplication of lights possessing moderate power. Estimated by the photometric volume, they are now

beaten on the Thames Embankment. But what Vestry would ever consent to increase the lighting-rate fourfold in order to put up Jablochkoff candles instead of gas-lamps? In all instances the parish authorities ought to burn more gas than they do. But if they are to have more light, their most economical plan will be to multiply the gas-lamps rather than to have the electric light. The fact that the Metropolitan Board choose to go to this extra expense for the sake of the Jablochkoff system, simply shows the desire of that body to give every encouragement to a system of lighting which is supposed to compete with gas. But at present the competition on the Embankment is apparent rather than real. Certain spots are intensely illuminated, and a great deal may be said about the total increase of lighting power. But there is nothing as yet to prove that the electric light is going to supersede gas for the illumination of the public streets. Even at the new price, the experiment is a costly one. The difference is 7s. 7d. per hour, and if the electric lights burn for no more than five hours per night, the extra cost will exceed £13 per week, so that the actual expense beyond that of the gas which would otherwise be burned will amount to nearly £700 in a year's time. We are aware the Board have something to put on the other side of the account, owing to the circumstance that when the electric lamps become extinguished at the end of the five or six hours during which they burn, the gas-lamps which they have superseded still remain unlit, the Jablochkoff lamps having taken their place. But this saving of gas is only effected by leaving the Embankment in a state of semi-darkness, and is an incident which is simply submitted to because it cannot be helped. The saving brought about in this way is therefore due to a defective arrangement, and does not properly enter into the question of the comparative cost of the two systems.

The experiment altogether is doubtless an interesting one, and great credit is due to the French Company for the zeal and ability with which they have so far conducted their enterprise. It is also a satisfactory incident that the lighting of the Embankment by this system is subject to the keen scrutiny of the Officers of the Metropolitan Board, so that the record of the results is authoritative. The Gas Companies thus have the advantage of knowing what can actually be accomplished with the electric light.

ABERSYCHAN GAS COMPANY.—The annual meeting of this Company was held on Thursday last—Mr. Henry Lewis in the chair. The Directors report, and the statement of accounts for the past year, were taken as read, and adopted by the Shareholders present. The result of the year's working showed that the maximum dividends to which the Shareholders were entitled had been earned, leaving a balance to be carried forward to the credit of the revenue account for 1880. Reference was made to the proposal of the Local Authorities in the district to purchase the Company's undertaking, the prevailing opinion being adverse to the scheme, on the ground that if it were carried out the district would not benefit by the change. The retiring Directors were re-elected, as were also the Auditors, Messrs. Gane and Jackson. Votes of thanks were passed to the Chairman and Directors, and to the Secretary and Manager (Mr. William White), for their attention to the business of the Company during the past year.

PRESENTATION TO MR. JOHN GLOVER.—An interesting meeting of the *employés* of the firm of Messrs. Thomas Glover and Co. was held at their factory, 214 to 222, St. John Street, Clerkenwell, on Thursday last, the object being to present to Mr. John Glover, the managing partner of the firm, a testimonial expressive of the high esteem in which he is held by all who are in his service, and the gratification experienced by them at his being enabled to return to business after his recent illness. The testimonial was presented by Mr. M'Donald, the cashier, and consisted of an admirably well-executed portrait of Mr. Glover, and an illuminated address, of which the following is a copy:—"Presented to Mr. John Glover, by the undersigned subscribers, *employés* in the firm of Thomas Glover and Co. (many of them upwards of 30 years), as a token of their respect and esteem for one who for so many years has proved a kind and just employer, and a true and generous friend. They congratulate him on his restoration to health, and hope that he may be spared for many years of happiness, to witness the beneficial results of his indefatigable exertions in the management of the works and business."

HORSHAM GAS COMPANY.—The annual general meeting of this Company was held on the 22nd inst.—Mr. J. Thorpe in the chair. The Directors, in their report, stated that, notwithstanding the reduction that had been made in the price of gas, from 5s. to 4s. 7d. per 1000 cubic feet from Lady-day last year, they were able to recommend the declaration of a dividend of 5 per cent. for the half year ending Dec. 31, making with the interim dividend paid at Midsummer a total of 9½ per cent. for the year. The erection of many new houses in the town and suburbs had rendered it necessary to make additions to the mains to the extent of 1434 yards, at a cost of upwards of £200. This had been paid for out of capital, but it would be for the consideration of the Shareholders whether the time had not now arrived for issuing the remaining 183 shares. The gradual increase in the Company's business rendered the present storeage room for gas inadequate to the requirements; the total storeage being 47,000 cubic feet, and the daily consumption sometimes reaching 90,000 cubic feet. The Directors therefore recommended the erection of a telescopic gas-holder to replace the largest holder at present upon the works. This would afford additional storeage room of 20,000 cubic feet, and would cost about £1000. The dividend recommended in the report was declared, and the retiring Directors and Auditors were re-elected, a sum of £100 being voted to the former for their excellent management of the Company's business. The question of increased gasholder room was left in the hands of the Directors.

URBAN WATER SUPPLY.

IN the last article on this subject (*ante*, p. 318) we referred to the important gravitation works of Bradford and Leeds as the source of supply to many of the towns, and indeed to a very large proportion of the inhabitants within the drainage area of the Aire. These two important towns have found it necessary to obtain water supply beyond their natural watershed, and have constructed reservoirs in the upper valleys of streams to the north of the Aire catchment. In the case of Bradford, there are no less than fifteen reservoirs, either completed or in construction, and several others authorized. Many of these, as storeage reservoirs, receive the rainfall of large tracts of moorland, and collect it in the upper valleys of the Worth and the Wharfe as well as the Aire. In all cases the water, after filtration, is conveyed by gravitation to service reservoirs near the towns where it is used. The daily supply for Bradford itself is 8¼ million gallons, considered equivalent to 24 gallons per head for domestic purposes, and 20 gallons per head for trade supply. It is safe to assert that a large part of this is wasted. The capital cost of works has amounted to nearly a million and a half sterling, or about £10 per head of population. The charge for water is at the rate of about 6d. per thousand gallons.

Bradford supplies as many as nineteen towns in various ways, the total population outside the municipal borough being 150,000, or about as much as that of the town itself. Some of the towns are themselves districts, and distinct Water Companies have been established to supply them from the Bradford reservoirs or mains. Of these Companies, the Calverley District Company supplies Calverley, Farsley, and Pudsey, but no information is given in the Return as to quantity, cost, or charge. Allerton has another Company which supplies 8 gallons per head per day, at a charge of 14·4d. per thousand gallons. The local works appear to have cost rather more than 20s. per head of the population. Liversedge and Gomersall are also supplied from Bradford through the agency of Companies, but no particulars of the charges are stated. Birkenshaw has hitherto been supplied from Gomersall, but changes are now expected. Eccleshill is supplied in bulk at 9d. per thousand gallons. The quantity allowed is at the rate of 10 gallons per head per day, but in 1874 it was reduced in amount, the result being great illness and inconvenience. The charge to the consumer is 1s. 5d. per thousand gallons. This is much complained of, but as the distribution works have cost £5000, and the interest on, and gradual repayment of this sum, as also the cost of maintenance, must be added to the price paid to Bradford, there is perhaps not much ground for such complaint. Birstal has a local service reservoir, and receives about 13 gallons of water per head per day by an intermittent supply. The local works have cost at the rate of 30s. per head of the population, and the charge is about 13d. per thousand gallons. Cleckheaton has a constant daily supply of 18 gallons per head at a charge of about 13½d. per thousand gallons. This is received by connecting the local mains with those of Bradford. The distribution works have cost a sum equal to 30s. per head of population. Heaton receives 7½ gallons per head by meter. The works here have cost £5 14s. per head of population, and are not yet completed. The charge is nearly 1s. 6d. per thousand gallons. North Bierley, a very large district, receives barely 7 gallons per head per day, the works having cost about 30s. per head of population, and the charge being 1s. 8½d. per thousand gallons. Of this charge, however, only 7d. is received by the Bradford Corporation. Silsden receives little more than 4 gallons per head per day. The cost for works has not reached 30s. per head of population, and the charge for water rather exceeds 1s. 6d. per thousand gallons. Drighlington has a local supply of 12 gallons per head, the works having cost 20s. per head of population, and the charge being only 9d. per thousand gallons. Gildersome receives 6½ gallons per head by a branch from the Drighlington main, the town paying part of the interest on the cost. The local works have cost only 12s. per head of population, but the charge for water is 1s. 8d. per thousand gallons. No reason is given for this great difference between the two towns. Hunsworth receives 10 gallons per head per day. The cost of permanent works and other expenses has been very small, and the water is sold at a charge which, according to the Return, amounts to 1s. 2d. per head per annum. Here, however, the quantity said to be supplied is little more than a gallon per head per day. There is probably some error in the figures. Tong is supplied from Bradford, but no information is given. Clayton is partially supplied by local mains connecting with the Bradford mains, but at present only the lower part of the town can obtain water. The cost of works here has been at the rate of 24s. per head of population. The

charge is 1s. 3d. per thousand gallons. Thornton is also partly supplied. The works have cost a sum equivalent to only 20s. per head of population, but the local expenses are very high, and the charge is 1s. 11d. per thousand. The actual payment for water to the Bradford Corporation by this town appears, according to the Return, to be 1s. 3d. per thousand gallons. No complaint, however, is made, and the Local Authorities have recently completed arrangements to increase the supply, which, at present, averages only 2½ gallons per head per day. Lastly, Denholme Gate is within the limits of the Bradford Corporation Acts, but, except through the agency of a private firm, does not receive any regular supply.

The town of Leeds is provided with water from the River Washburn, a tributary of the Wharfe, the water being stored in a succession of noble reservoirs affording ample provision not only for the town, but for a large additional population, the storeage being sufficient to ensure a good supply even in times of exceptional drought. The total estimated yield when the system is complete, and all the reservoirs are constructed and in use, is as much as 14 million gallons per day; but at present only half that quantity is required for the town, the average daily consumption being about 25 gallons per head—one-third for domestic purposes, and two-thirds for trade. The cost of these magnificent works and of the distributing-pipes has amounted to a sum equivalent to a little less than £5 per head of population. The charge for water is at the average rate of something more than 6d. per thousand gallons.

Leeds supplies some towns in the immediate vicinity, of which Headingley has the largest population, but neither this town nor Bramley is referred to in the Return. Morley and Churwell are mentioned. The former, with its population of nearly 10,000, receives at present about 15½ gallons per head per day for all purposes, but might demand 250,000 gallons per day. It is delivered to the borough at the rate of 7½d. per thousand gallons, and distributed by works which have cost at the rate of £2 6s. 10d. per head of population, and the local charge for water is stated to be 16·68d. per thousand gallons. Churwell is a small town, and has works in progress. The cost and charge of distribution cannot be estimated. It will have a small service reservoir. Rothwell, with Rothwell Haigh and Royd's Green, has a service reservoir to contain 24 hours supply, which is charged for by the Leeds Corporation at the rate of 7½d. per thousand gallons. The quantity stated to be used is only 3 gallons per head per day. The cost of the permanent works for receiving and distributing the water has been equivalent to £1 5s. 4d. per head of population, and the charge to consumers is 9·2d. per thousand gallons.

The River Calder, flowing almost entirely over the coal measures during its lower course, is even more remarkable than the Aire for the large urban population, amounting to nearly 450,000, within its drainage area. It contains three principal towns—Halifax, Huddersfield, and Wakefield—not one of them so important as Leeds or Bradford, but still ranking among the chief manufacturing centres in Yorkshire. In the upper part of the Calder are Todmorden, Langfield, and Luddenden Foot, in none of which are there any public arrangements for water supply. Halifax comes next in order. Its water-works comprise a number of storeage reservoirs impounding the waters of the Ogden, the Luddenden, and the Hebden Brooks, some completed and in operation, others in progress. The quantity supplied to the town is at the rate of 40 gallons per head per day for all purposes. The cost of works is equivalent to £9 11s. 6d. per head of population, and the charge is 8d. per thousand gallons.

Of the towns supplied by Halifax, Elland is the most peopled. It receives about 9 gallons per head per day, but might claim much more. Its local works have cost a sum less than 10s. per head of the population, and the charge to consumers is 10d. per thousand gallons. Sowerby Bridge is said to receive 24 gallons per head per day. The cost of the local works has been nearly £10 per head of population, and the charge is about 10¼d. per thousand gallons. Brighouse receives 12 gallons per head, at a charge of about 1s. per thousand gallons, the works having cost only about 10s. per head. Thornhill is allowed 9 gallons per head per day, with power to increase the quantity. The cost of works has been nearly 40s. per head of population, and the charge is 1s. 5d. per thousand gallons. Rastrick appears to take 10½ gallons per day, but might claim 13 gallons per head for the present population. The price paid to Halifax is 6d. per thousand gallons. The works have cost a sum equivalent to 20s. per head of the population, and the charge to the consumer is 10½d. per thousand gallons. Hebden Bridge receives only 3½ gallons per head per day, out of a total of 4½ permitted under an agreement which can be modified at the end of twelve months. The local works have cost a sum equivalent to 12s. per head of the population. The annual amount of water-rates, as given in the Return, does not cover the cost of maintenance and interest on money borrowed, and is probably stated in error. The towns of Nether and Upper Soothill, and that of Horbury, have a separate service reservoir. Nether Soothill takes 7¼ gallons, Upper Soothill 18 gallons, and Horbury 6¼ gallons per head per day. The cost of permanent works has been at the rate per head of 10s., £5 11s., and £2 8s. respectively, the chief works being in Upper Soothill. The charge for the water does not appear from the figures given in the Return, but we gather that at Nether Soothill it is about 1s. 5d. per thousand gallons. Hippersholme has a daily supply of 14 gallons per head, which might be largely increased. The cost of works has been at the rate of 20s. per head of the population. The charge for water is 13·6d. per thousand gallons, the actual cost of the water as paid to Halifax being 6d. per thousand gallons. A part of the town of Ovenden is supplied from Halifax, and about three-fourths of that of Greetland, the rest making use of local wells. Of the former town there are no particulars. Of Greetland we learn that the supply is at the rate of 7½ gallons per head per day, the charge being 15·8d. per thousand gallons.

Of the other towns on this part of the Calder drainage area we learn that Sowerby Bridge is supplied from springs and wells, but has not any works. The same is the case with Northowram, Southowram, Denby, Slaithwaite, and Linthwaite. These complete the list so far as the main branch of the Calder is concerned, leaving the towns in the sub-drainage area of the Colne and its feeder the Holme, and also those of the Lower Calder and the Aire after its junction with the Calder, for consideration in another article.

THE WORKING OF THE ARTIZANS DWELLINGS ACT IN LONDON.

An extraordinary account as to the sanitary condition of some parts of Whitechapel appears in the last Quarterly Report of Mr. J. Liddle, the Medical Officer of Health of that district. The principal facts are contained in the reports of the two Sanitary Inspectors appertaining to Whitechapel, and Mr. Liddle calls attention to the statements thus given as being of "great importance." One of the Inspectors describes the state of things existing in the neighbourhood of Goulston Street, situated in the north portion of the Whitechapel district. It appears that the courts and alleys thus referred to form part of an "unhealthy area" about to be dealt with by the Metropolitan Board of Works, under the Artizans and Labourers Dwellings Act of 1875. Many of the houses are said to have been condemned by the Metropolitan Board as "unfit for human habitation;" but, unfortunately, they continue to be inhabited, and their sanitary condition is "becoming worse every day." There is said to be great difficulty in getting the landlords to do anything in the shape of amelioration, and this is shown to arise from the peculiar position in which the property is placed pending its final disposal. Mr. Wrack, the Inspector, states towards the close of January last: "The claims of the several owners of pro-
"perty in the area are being considered by the Metropolitan
"Board of Works, and some of them, I believe, have already
"been settled; but up to the present time not one of the
"houses in this wretched locality has been closed or pulled
"down under the Act." The official representation as to the unhealthiness of the area was made as far back as May 31, 1876. At what date the Metropolitan Board undertook to apply the Act to the place in question is not stated, but the business appears to have been in hand some time, and the effect so far has been—if we may judge by the reports of the local officers—to make matters very much worse than they were at the beginning.

The case is instructive, as showing the working of the Artizans Dwellings Act according to its present constitution. When once a neighbourhood comes under what we may term the ban of this enactment, that which before was serious then becomes critical. Property once condemned is not likely to be improved, and a general spirit of lawlessness seems to infect the landlords directly they find their property is scheduled in an improvement scheme. Property thus circumstanced is the despair of Sanitary Inspectors. "It is only
"by daily visiting the localities," says Mr. Wrack, "and fre-
"quently urging the landlords of some of the property to
"effect the necessary improvements, that I am able to get any
"sanitary works carried out." The Inspector deplores "the
"shocking condition of the dwellings" in certain places

which he specifies. "The unhealthy appearance of the "persons occupying such places," he says, "especially the "young children, is very lamentable, and causes me great "anxiety." The area is "much overcrowded," and the Inspector fears the worst should any epidemic disease once enter the neighbourhood. The consequences in such a case, he apprehends, "would be very serious." On the strength of this report, the Whitechapel Board communicated with the Central Authority at Spring Gardens; but the latter replied, stating, "It does not appear that the complaint of "the Inspector extends to any part of the property already "acquired by this Board." Hence the central body declared itself "not in a position to take any action towards remedy-"ing the evils to which its attention is directed." Nevertheless, all the houses referred to by Mr. Wrack are situated in the area of the Goulston Street scheme, and Mr. Liddle accordingly expresses his hope "that the work of demolition "and re-construction will, with as little delay as possible, be "carried into effect."

"Demolition" Mr. Liddle may look for; but "re-construc-"tion" we fear may be very remote. The Act works slowly, and its first effect is evidently to aggravate the evil it is intended to cure. If the Inspectors are in perplexity, Mr. Liddle is equally troubled. He points out that while negotiations are in progress between the Metropolitan Board and the landlords, it is not likely that any improvementswill be carried out, and the reasonable expectation is that "matters "will become worse and worse." The only effectual remedy, in the opinion of Mr. Liddle, is "either to close the houses, or "to demolish them with as little delay as possible." So thoroughly is Mr. Liddle shocked at the scenes which he witnesses, that he would much rather see the people ejected and the houses pulled down. "Some inconvenience," he says, "may be expected to be felt for a time when masses of "the people are removed from a locality; but, in my opinion, "greater inconvenience will be experienced in allowing these "wretched houses to remain." We wish it were possible for Mr. Liddle to prove the correctness of the view which he thus entertains. As the Medical Officer of a crowded East-end locality, we are startled at the complacency with which he contemplates the summary ejectment of a multitude of people from their homes, when, as yet, no provision has been made elsewhere for their reception. A great part of their present misery arises from overcrowding, an evil which itself accrues from a deficiency of house accommodation. To shut up or pull down certain houses now inhabited, would be to establish a still further disparity between the population and the extent of the accommodation provided for them.

The fact is, we are face to face with a very awkward problem in the working of the Artizans Dwellings Act. There are houses which are not fit to be inhabited, and which cannot even be made fit, owing to their structural defects. To condemn them, and yet to leave them occupied, is to throw them into a more miserable state than they were before. To shut up these houses, or pull them down, is to pack the poor population of London into still closer quarters. Mr. Liddle avers that "the working classes who have been "compelled to remove in consequence of their houses being "demolished for public improvements, readily find lodgings "elsewhere," and he refers to certain of his previous reports in proof of that statement. That the poor people thus ejected find lodgings somewhere, we have no doubt; but we fear it has been with one of two results, as affecting themselves—namely, either increased cost or increased inconvenience. Speaking some time ago of Mr. Cross's Act, Mr. Liddle said: "I have not the slightest fear that inconvenience "to any appreciable extent will be suffered by the people "who will be displaced under the provisions of this statute." We should like to share Mr. Liddle's confidence; but we confess we view with something like dismay the clearance of populated districts, while the process of reconstruction is scarcely commenced. Mr. Liddle says in his present report: "In my opinion there was no necessity to make extensive "provision in the Act for the building of houses for the "labouring classes." And he adds: "Indeed, it would be "interesting to be informed of a single instance in which "such provision has been made, and appropriated to the "actually dislodged families." For our own part, we should be interested in finding a single brick reared anywhere in London for the benefit of the aforesaid "dislodged families," under the provisions of the Artizans Dwellings Act. Demolition follows slowly on the heels of condemnation, and construction is not yet heard of.

But there is a worse page yet in this Whitechapel report, and some parts of it are so bad that we forbear to quote them. It is piteous to think that any of the labouring classes of London, however poor and abject, should be thus housed. Mr. Isaac Battram, the Sanitary Inspector of the south side of the district, gives an account of certain "courts and turnings "south of Royal Mint Street." It appears that here again we have another "unhealthy area" which has been brought under the wing of the Metropolitan Board. The date of Mr. Battram's report is somewhat later than that of Mr. Wrack's, being as recent as the beginning of last month. Concerning the places enumerated by the southern Inspector, we are told, "A more deplorable state of things could not pos-"sibly exist." Some of the houses—if they can be so designated—are destitute of the barest and most essential sanitary appliances. In some instances there is "no water supply," and in others there is too much, the premises being flooded through defective fittings, the water finding no sufficient out letby way of the drains. "The yards are also badly "paved, and there are no dustbins." After wading through a hideous catalogue of miseries, we read, "The whole of the "above-named houses are the property of the Metropolitan "Board, and that body receives the rents thereof." "Every "room is occupied by a separate family, and some of the "rooms are overcrowded or indecently occupied." The Inspector asks that either the houses shall be closed, or steps taken to "put them in a proper sanitary condition;" and he very properly points out that should this state of things last until the hot weather sets in, an outbreak of fever or other contagious disease may be pretty confidently expected.

Most likely it is a feeling of humanity which induces the Metropolitan Board to let the people remain in these miserable habitations, although the idea of anything humane in connection with a revenue of rents drawn from such a scene of wretchedness seems fearfully incongruous. We feel assured that the Board are not influenced by mere pecuniary considerations in taking these rents and letting the people remain, otherwise we could scarcely find language too strong to denounce such a glaring inconsistency on the part of a great public authority. This wretched property is temporarily in the hands of the Board, and must so remain until a certain stage in the proceedings under the Act is arrived at. We should like to see the worst of the property pulled down at once, and decent dwellings built upon the space thus cleared. If only a dozen houses—or even half a dozen—were thus improved off the face of the earth, there would be a beginning, and that a good one, and more rapid progress could be made afterwards. As it is, the Act moves with slow and lumbering pace. After a long to-do, the people get turned out and the houses are pulled down. Then the land lies waste, perhaps for years. At last we may look for the buildings—we have not seen them yet—and by-and-by they will be occupied; but who the occupiers will be it is hard to determine. The people who were turned out from the old buildings will in many instances have migrated elsewhere. Some of them—perhaps a good many—will be dead. Possibly the very character of the neighbourhood will have changed in the interval, and the labouring classes will no longer care to dwell there. The Artizans Dwellings Act is neither quick enough in its working, nor practical enough in its application, to cope with the evils it is designed to remedy. That it will do good in the end, we believe; but its present effect is in many respects unsatisfactory. Better success may attend it in the provinces. In London it makes matters worse as a preliminary to mending them; and, unfortunately, the preliminary process threatens to be a very long one. The costliness of the entire proceeding is another point, and one on which we fear the ratepayers will have a good deal to say from time to time. The Act embodies a noble principle, but it requires further amendment to make it practical. It ought not to be so expensive, nor yet so slow, neither so awkward in its application, adding—at least for a time—to the very misery it was designed to remove.

Stockton and Middlesbrough Water Supply.—On Saturday, the 20th inst., Mr. C. Neale Dalton, one of the Inspectors of the Local Government Board, held an inquiry at the Town Hall, Middlesbrough, into an application by the Stockton and Middlesbrough Corporations for a Provisional Order to amend the Stockton and Middlesbrough Corporations Act, 1876. Mr. H. G. Faber (the Town Clerk of Stockton) stated that the Order applied for was to enable the Stockton Corporation to borrow money for the purpose of acquiring the Stockton and Middlesbrough Water-Works, authority to purchase which was granted by the Act of 1876; to enable the Water Board to borrow money for the extension of those works; to enable the Board to pump more than 60 million gallons per week from the River Tees, any additional water so taken being supplied from a compensation reservoir on conditions to be determined; and, lastly, to extend the times for the commencement and completion of the works authorized by the Act, and for the compulsory purchase of land. Some conversation having taken place respecting the abstraction of water from the River Tees, the Inspector said that he would report early to the Local Government Board.

Communicated Articles.

THE CORROSION OF IRON.

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SEVENTH AND LAST ARTICLE.

Sir Humphry Davy first suggested the application of the principle of preserving metals at the expense of zinc by coupling the two together, to the protection of sheathing of wooden ships. Sheets of zinc were to be applied to the surface of the copper, so that the surfaces of the two metals should be not only physically but electrically connected. When such an arrangement is immersed in an exciting liquid like sea water, the zinc is the negative element in the system, and undergoes chemical change. Any chemical action which copper would undergo, when immersed alone, is in this way avoided, and transferred to the zinc. In my second article, the leading features of this class of phenomena have been noticed. The application of the principle has been extended to the preservation of wrought and cast iron. Davy himself suggested that zinc or *tin* might be used for preserving iron. In suggesting *tin* for this purpose, he fell into an error—an error which he, no doubt, was soon informed of by his contemporaries. When tin and iron are coupled together in a saline solution, the iron is negative to the tin, and undergoes chemical change. Tin is, therefore, not a preservative of iron as suggested by Davy; on the contrary, it is itself preserved at the expense of the iron. When zinc and wrought-iron plates free from rust are placed face to face, and the whole immersed in fresh water freely exposed to the air, the iron plates are preserved from oxidation until a large amount of the oxide of zinc has collected at the points of contact of the metals. When this condition of things is reached, the iron ceases to be preserved—it undergoes oxidation. In saline solutions similar results follow, the chief difference in the two cases being that in saline solutions the oxide of zinc collects more slowly, probably in consequence of the solvent action exercised by the saline matter on the oxide of zinc. At length, however, the oxide of zinc is deposited on the surface of the iron, and the preservative action of the zinc then comes to an end. In order to obtain good results by this method of proceeding, the mass and area of the zinc must be comparable with those of the iron which it is intended to preserve. To maintain this condition of things in ordinary cases is inconvenient, and therefore the good results at first anticipated have not been realized in consequence of the difficulty of fulfilling the requisite conditions. Further, where the preservation of the iron is more a matter of economy than of absolute necessity, it is questionable whether great advantages could be obtained by the use of zinc protectors even in the most favourable cases. The principle could not be well applied to the preservation of iron gasholders; and in many similar instances the remedy would be as bad as, or worse than the disease.

Pepys proposed the use of zinc plates for the preservation of polished iron and steel exposed to atmospheric air. There are, however, the same limitations in this case as in those already noticed. The corrosion of the iron is very considerably *retarded*, but not altogether prevented, and when the iron does begin to corrode, the zinc then completely fails to exercise a beneficial action.

This leads to the consideration of iron the surface of which is completely covered with a perfectly adherent layer of metallic zinc. One generally speaks of such as "galvanized" iron. Though it is possible to coat iron with zinc by means of a weak electric current (electro-plating), the so-called galvanized iron is obtained differently. It is prepared by taking plates or sheets of wrought iron, and entirely cleansing their surfaces from every trace of rust. They are then thoroughly dried, and completely immersed in a bath of molten zinc. The zinc and particles of iron on the surface of the plate chemically combine to form an alloy, and on removing the plate from the bath the greater portion of the zinc so removed remains adherent to the plate in consequence of its being alloyed on the iron surface. It is found that the zinc surface adheres more firmly if the iron plate be immersed in a bath of molten tin (that is, converted into tinned iron) before immersion in the zinc bath. From what has been said respecting the electrical relations of tin and iron in exciting liquids, it follows that, should such galvanized iron be abraded or corroded so as to expose the two metals, tin and iron, the iron would then be subjected to undue corroding influences.

"Galvanized" iron, therefore, is iron covered with a uniform layer of metallic zinc, the two metals being alloyed together at their surfaces of contact. So long as the underlying iron is not exposed at any point, we may regard the whole as a mass of solid zinc. Zinc is a metal particularly well adapted for resisting ordinary corroding influences, such as atmospheric air and moisture. A bright surface of the metal, it is true, soon tarnishes when exposed to these influences, but the layer of suboxide thus formed preserves the metal from further corrosion. Alkaline salts, such as common salt (NaCl), sensibly dissolve such oxide, and caustic alkalies, including ammonia, dissolve it with the greatest facility. Zinc is a metal ill adapted for cases where it is likely to be exposed to acid vapours, such as arise from the combustion of sulphur or sulphur compounds.

Assuming that galvanized iron is used in the construction of gasholders, what will be their probable duration in a hot climate? Air and moisture would have but little action on the zinc, and therefore there would be little to fear in this direction. It is rather to the presence of ammonia in the gas and brackish water in the tank that we must look for agencies tending to corrosion. Since the coating of suboxide on the surface of the metallic zinc is the medium which preserves the metal from rapid change, it follows that ammonia, which is a ready solvent of the oxide, must be prejudicial to the duration of the holder. It is well known to chemists that not only do the caustic alkalies, including ammonia, readily dissolve oxide of zinc, but that potash and soda also dissolve *metallic* zinc with the evolution of hydrogen gas. The action is augmented by increase of temperature. It is therefore very essential to know how metallic zinc would behave in a weak solution of ammonia. I have taken granulated commercial zinc, and thoroughly drenched the fragments with a strong solution of ammonia, so as to dissolve the oxide on the surfaces of the pieces. After rinsing with distilled water several times, a very weak solution of ammonia was then added, so as to thoroughly cover the zinc, and the whole was left loosely exposed for a couple of days. The ammonia solution was then removed and examined for dissolved zinc. The pieces were again rinsed with distilled water, weak ammonia solution added, and the whole allowed to stand as before. The process was repeated on the same pieces several times in this way, the ammonia solution being always found to contain very appreciable amounts of zinc. These results may be primarily due to the oxidation of the zinc in consequence of access of atmospheric air, and not owing to solution of the zinc direct, as in the case of potash and zinc. But the distinction is of no practical moment in the present instance, because we have seen that there are always small quantities of oxygen in coal gas; and therefore, if ammonia is allowed to be present in the gas supply in quantities above the merest traces, there will then be in the interior of the gasholder all the conditions which were present in the experiments I have made. It is obvious, therefore, that the galvanized iron would be very seriously affected in a hot climate, if the gas supply contained sensible quantities of ammonia. The influence of brackish water on the zinc would be to dissolve the protecting surface of oxide, and in that way expose the metal to fresh oxidation. There would also be the general electrical action set up between the galvanized iron holder and its iron pillars, unless the two were specially insulated, and it would be difficult to effect perfect insulation, in consequence of the continual change of the points of contact of the two metals. But the use of brackish water is not generally imposed on the gas engineer, and as the ammonia can be entirely removed from the gas in an economical manner, even in a hot climate, there is no reason why these two circumstances should prevent the employment of galvanized iron in special cases, seeing that it promises well. I imagine that the drawbacks to its use are rather of a mechanical than a chemical nature. The holder would necessarily require to be constructed from sheets of the metal, and the rivets employed would be of iron. Therefore, unless the heads of the rivets presented an unbroken surface of zinc (that is, they must be galvanized), there would be an undue tendency to corrosion on the part of the zinc. Such a gasholder admits of being protected by varnishes and paints, as in ordinary cases, and it would, no doubt, be found advisable to pursue this course.

I now come to a consideration of Professor Barff's process for preserving iron. It consists in heating the metal in an oven (muffle), through which a stream of superheated steam is made to pass during the operation. Certain temperatures have to be maintained, and atmospheric air must be excluded, in order that the film of oxide produced shall be perfectly adherent to the surface of the iron. The steam, under the circumstances, is decomposed by the iron, producing black oxide of iron (Fe_3O_4) and gaseous hydrogen, which escapes from the heated chamber. The reaction is expressed thus:—

$$3\,Fe + 4\,H_2O = Fe_3O_4 + 4\,H_2.$$

The time needed to coat the iron surface with the black oxide of a sufficient thickness varies slightly according to the description of iron treated. At the end of seven or eight hours the film of black oxide is sufficiently thick for the purposes for which the iron is intended. I need not repeat the description of the properties of this oxide. It has been abundantly proved that iron can be successfully coated in this way, and that the resulting product is proof against all ordinary and extraordinary corroding agencies. The result, in fact, is iron in a condition pre-eminently adapted for the purposes I am considering, and not subject to those limiting conditions which characterize galvanized iron. I also understand that the cost of production is not greater than that of the latter. There is therefore no reasonable ground for believing that a gasholder constructed of wrought iron, coated by Barff's process, should not have an almost unlimited duration, even if exposed to the highest atmospheric temperatures in the presence of any or all of the impurities of coal gas which have been noticed.

The only possible objections to its use are purely of a mechanical description. The coefficient of elasticity of the black oxide is not the same as that of metallic iron; and therefore, when a sheet of iron which has been thus coated is seriously twisted or bent, the oxide cracks and admits of corrosion of the iron at the base of the fissures. Severe hammering also destroys the continuity of surface of the oxide. Neither of these imperfections, however, is likely to prevent the successful use of the iron for the construction of a gasholder, provided a reasonable amount of intelligence is exercised by those engaged in building it.

The application of Portland cement as a protective covering for iron is due to Major Crease. The conditions originally observed in using the process are not adapted for our requirements, and it would appear that the inventor has been striving to modify the principle, so that cement in a fluid condition can be prepared and applied as an ordinary paint. In Mr. Douglas's recent paper the subject is so fully dealt with, both from a chemical and a financial point of view, that I shall give a mere outline of the process. A bituminous varnish analogous to coal tar is applied in a hot state to the clean iron. When the varnish is hard, a specially prepared form of Portland cement is applied by means of a brush, like an ordinary paint. When the

cement hardens it performs a double function — firstly, it lends support to the pitch beneath it, counteracting its viscous character; and, secondly, it forms an additional coating impervious in a great measure to water and gases. Supposing Crease's process to be applied to a gasholder in a hot climate, the first question which suggests itself is—How would the cement coating behave when subjected to excessive alterations of temperature? If the coefficient of expansion of the cement coating be nearly the same as that of the iron it covers, there is no danger of the cement becoming detached from the iron. Iron tanks have been coated by the original process, and used for storing water at all temperatures up to near the boiling point. At the end of several years the cement lining has been found perfect. This fact is of itself sufficient to show that the coefficient of expansion of the cement is practically the same as that of the iron. The great merit of the inventor's improvements consists in his producing a perfectly smooth and semi-fluid form of cement, which admits of being applied by means of an ordinary paint-brush, and giving, in a few hours, a hard and impervious layer.

I cannot conclude without referring to a matter of historical interest. I am indebted to Dr. Percy for the information that Liebig contributed an article upon the corrosion of iron to the *Cornhill Magazine* for September, 1865. In it he says that the rusting of iron will not take place, even in moist air, unless carbonic acid gas is present. The magazine in question is not one in which such an article would be looked for, and this is the only apology I can offer for my ignorance of its existence.

THE THEORY OF DISSOCIATION.

By Mr. H. B. Dixon, M.A.,
Millard Lecturer on Chemistry at Balliol and Trinity Colleges, Oxford.

IV.

A year later than the experiments detailed in my last article—1866—Würtz published a second paper on the vapour density of amylene hydrobromide, which boils at 113° C., and exhibits a normal (2-volume) density up to 185° C. At this point it begins to decompose, its density gradually falling as the temperature rises till at 360° C. it occupies double the volume. If hydrobromic acid and amylene are brought together below 185°, they should combine completely; but if brought together above that temperature, only partial combination should take place. A delicate thermometer placed in the vessel where the gases meet will give, by its rise, an indication that chemical combination has taken place, and the amount of rise will also be roughly a measure of the amount of combination. The apparatus employed by Würtz resembled that devised by Deville to detect a rise of temperature when hydrochloric acid and ammonia were allowed to come into contact at 350°. Würtz found that hydrobromic acid and amylene heated to 120°, and meeting in a vessel at that temperature, caused a mercurial thermometer plunged in their midst to rise between 4° and 5°. When the two gases were brought together at 220° the mercury only rose through half a degree in the thermometer. The combination in the second case is only a fraction of that taking place at the lower temperature.

These researches of Würtz led Deville to make some further experiments on phosphorus pentachloride. Phosphorus pentachloride, according to Cahours, possesses a regularly decreasing vapour density. At 182° C., just above its boiling point, its density is 5·08; at 300° C. its density is 3·61; at 182° its density corresponds with a condensation into three volumes; at 300° its density corresponds with a condensation into four volumes.

In this gradual diminution of density it resembles amylene hydrobromide; but it also resembles sulphur and acetic acid, which have a co-efficient of dilation that diminishes with the temperature. Two colourless glass tubes, about 15 inches long, closed at their extremities by plane faces of glass, and having a minute aperture to allow the enclosed gas to escape, were filled, one with an equal mixture of air and chlorine, the other with pentachloride of phosphorus. The two tubes were passed through an oil bath, from which their extremities slightly projected, so that the colour of the gases could be examined through the length of the tubes while they were exposed to the heat of the bath. As the temperature rose, the chlorine colour gradually became manifest in the tube containing phosphorus pentachloride, and increased in depth until the colour in the two tubes was sensibly the same. If the vapour of pentachloride of phosphorus is uncoloured, this experiment is a sure proof of its dissociation into free chlorine and phosphorus trichloride.

If iodide of mercury is heated in a small flask, it changes colour, melts, and volatilizes, giving rise to a colourless vapour of unchanged iodide of mercury, which on cooling condenses to a brown liquid. If the flask is heated strongly with a Bunsen burner, violet clouds are produced near the surface of the glass, which disappear as they travel towards the centre of the flask, where in the cooler space the dissociated mercury and iodine molecules re-combine. If a second similar flask containing equal volumes of air and iodine is heated to the same temperature, the colour is much more intense than in the flask containing iodide of mercury. This experiment shows the dissociation of the iodide to be only partial at the temperature employed.

These two experiments performed by Deville show that the decrease in density of the vapours of phosphorus pentachloride and mercury iodide is due to dissociation of the compounds into two constituents, which re-combine again on cooling. But the fact that complete dissociation can be proved to take place, in the case of one or two compounds, at a temperature not far removed from their boiling points, does not necessarily imply that all compounds exhibiting an abnormal vapour density are dissociated at the temperature at which their densities are determined. Admitting that amylene hydrobromide and phosphorus pentachloride owe their decrease in density to dissociation, Deville still considered that the molecules of other bodies occupied, without decomposition, four times the volume occupied by an atom of hydrogen, their expansion being abnormal, like that of sulphur and acetic acid. As an instance, he gives the body produced by the union of ammonium iodide and mercury iodide, NH_4I, HgI. Its density, as determined at 350°, was 6·38; as determined at 440°, it was 6·49. The density calculated for 4 volumes is 6·44. Now, if the compound underwent dissociation when volatilized, it should occupy 6 volumes:—

Ammonium iodide	4 vols.
Mercury iodide	2 „
	6 vols.

Marignac, in 1867, published his experiments on the latent heat of volatilization of ammonium chloride. If it be true that this compound breaks up into hydrochloric acid and ammonia at the temperature at which it volatilizes, then the quantity of heat absorbed in the process should be much greater than that absorbed by the volatilization of other salts, which undergo no chemical change as they pass from the solid to the gaseous state. Marignac employed a massive metal cylinder, in the upper surface of which three cavities of equal size were hollowed out symmetrically round the axis. The cylinder being heated from below, weighed quantities of different substances in open glass or silver tubes were placed in the two cavities, and an air thermometer in the third. After a certain time the residues were weighed, their loss in weight giving the quantities of the different substances volatilized in a given time, while the cylinder cooled through an observed range of temperature. By this means the latent heat of volatilization of ammonium chloride and of other substances was approximately determined, the heat supplied by the cylinder to each cavity being sensibly the same in unit time. The latent heat of volatilization of 1 gram of ammonium chloride was found to be 706 calories—a calorie being the amount of heat required to raise 1 gram of water 1° C.

Now, the heat of combination of hydrochloric acid and ammonia at ordinary temperatures, as determined by Favre and Silbermann, is 743 calories; at 350° C., the heat of combination would be 715 calories. The near agreement between this number and the latent heat of volatilization of ammonium chloride makes it exceedingly probable that in passing into the state of vapour the compound has broken up into its chemical constituents, which re-absorb the heat they gave out in combination. Tried by the same process, the latent heat of volatilization of mercury perchloride was found to be about 36 calories only.

The vapour density of phosphorus pentachloride, which at 182° C. corresponds with a condensation into 3 volumes, has been determined by Würtz at a lower temperature. In a first series of experiments, he placed into a flask, containing dry air, some freshly-distilled pentachloride, and heated the whole in a transparent bath of melted paraffin. The moment the last trace of the pentachloride was seen to disappear, the orifice of the tube was sealed. After the flask was cooled and weighed, the sealed tube was opened under mercury, and the residual air remaining in the flask was measured. By this means the weight of the phosphorus pentachloride vapour present in the flask at the moment of sealing was determined, and also the pressure under which it existed, for the volume occupied by the air in the flask at the temperature of the experiment could be easily calculated from the volume found on cooling. The following were the results obtained by Würtz:—

Experiment.	Pressure supported by Vapour.	Temperature.	Density of Vapour.
1	311 mm.	145°	6·7
2	307 „	145°	6·3
3	391 „	145°	6·6
4	148 „	137°	6·5
5	243 „	137°	6·5
6	234 „	137°	6·4
7	281 „	137°	6·5
8	269 „	137°	6·5
9	170 „	129°	6·6
10	165 „	129°	6·3

In these experiments the pressure supported by the vapour of the pentachloride varied from one-half to one-fifth of an atmosphere. Its density is 6·5, a number considerably higher than the maximum observed by Cahours at 182° C., but still some distance from the number 7·22, which is the theoretical density for the pentachloride when its molecule occupies 2 volumes. At the temperatures employed in these experiments the pentachloride still suffers some decomposition, though less than the decomposition it undergoes at its boiling point under atmospheric pressure.

In order to prevent the dissociation of the compound, Würtz had recourse to a device founded on the views enunciated by Deville. Seeing that dissociation gradually diminishes as a compound finds itself under an increasing tension of one or both products of its decomposition, and finally ceases when this tension has reached a certain fixed amount for every given temperature, Würtz conceived the idea of preventing the dissociation of phosphorus pentachloride by volatilizing it into a space containing already a large quantity of the vapour of the trichloride, one of the products of its dissociation. Into a flask with its neck drawn out to a point and carefully dried, he put a very small quantity of the pentachloride, and then an excess of the trichloride. The flask was then heated in a transparent bath of paraffin, and the weight of the mixed vapours determined in the usual way. The point of the flask was then broken under distilled water, and in the solution of phosphoric, phosphorous, and

hydrochloric acids thus obtained, the amount of chlorine was determined by precipitating and weighing it as silver chloride. In several of the experiments the amount of phosphorus was also determined as magnesium pyrophosphate, to act as a check upon the chloride determination. In this manner the weight of pentachloride and trichloride in the flask at the moment of sealing could be calculated, and hence the vapour density of the former. Twelve experiments were performed with the following results:—

Experiment.	I.	II.	III.	IV.	V.	VI.	VII.	VIII	IX.	X.	XI.	XII.
Pressure supported by PCl_5	mm. 194	mm. 338	mm. 168	mm. 271	mm. 343	mm. 174	mm. 411	mm. 394	mm. 214	mm. 413	mm. 318	mm. 423
Density	7·2	7·4	7·7	7·1	7·0	8·3	6·9	7·2	7·4	6·8	7·0	6·9

The mean of these numbers is 7·23, the theoretical density for a 2-volume condensation being 7·22. The temperature of the paraffin bath only varied in the twelve experiments from 160° C. to 177° C., and was very close to the temperature 182°, at which Cahours observed a density of 5·08. Würtz therefore concludes that in an atmosphere of phosphorus trichloride, phosphorus pentachloride volatilizes without decomposition, its molecule occupying twice the space occupied by an atom of hydrogen.

During the last year or two the controversy has been chiefly confined to the question of the dissociation of chloral hydrate. This compound, according to the exact determinations of Naumann, has a density of 2·83 at 78° C., and a density of 2·81 at 100° C. Its formula, $C_2H_2Cl_2O_2$, indicates a density of 5·72 compared with hydrogen. In the gaseous state the compound therefore occupies exactly twice the normal volume, and, accordingly, it is supposed to be dissociated at 78° C. into equal volumes of anhydrous chloral vapour, $C_2H\,Cl_3O$, and steam, H_2O. Naumann found that when a quantity of chloral hydrate, more than sufficient to saturate the space above it, was heated to a given temperature in a tube over mercury, the tension of the vapour gradually increased for a considerable time. Thus, when the tube was heated to 35° C., the tension rose in an hour from 12 to 17 millimètres of mercury. At 78° C. the tension rose in 40 minutes from 261 mm. to 296 mm. The compound appears incapable, according to Naumann, of existing in the gaseous state even at ordinary temperatures; the vapour given off is the result of a chemical decomposition, which proceeds more slowly as the space above more nearly approaches the saturation point.

Troost, however, has endeavoured to show that chloral hydrate is not dissociated when it is volatilized. The method he employed depends on the fact that hydrated salts, which give up their water when heated in a space containing no aqueous vapour, suffer no decomposition when heated in a space already containing more aqueous vapour than they themselves emit at the particular temperature employed. If chloral hydrate, when heated, is dissociated into anhydrous chloral and steam, half the observed tension will be due to steam:—

$$C_2H_2Cl_3O_2 = \underset{2\text{ vols.}}{C_2H\,Cl_3O} + \underset{2\text{ vols.}}{H_2O}.$$

If there is passed up into such an atmosphere a hydrated salt, such as crystallized potassium oxalate, the "dissociation-tension" of which is less than the tension of the steam at the temperature of the experiment, then the oxalate will not give up its water of crystallization, for it will find itself in presence of a larger quantity of steam than it itself could emit. The level of the mercury will accordingly remain unaltered in the tube. But if, on the other hand, the chloral hydrate exists as such in a state of vapour without dissociation, then the oxalate will give up its water of crystallization to the dry space, and the level of the mercury in the tube will fall. Crystallized potassium oxalate, according to Troost, has a dissociation-tension of 53 millimètres of mercury at 78° C.—*i.e.*, the salt passed up into the vacuum of a barometer, and heated to 78° C., would give off sufficient steam to depress the mercury through 53 mm.

Into the closed end of a dry tube standing over mercury, and heated to 78° by the vapour of boiling alcohol, was passed a small weighed quantity of chloral hydrate, which totally volatilized. The tension of the vapour remained constant at 117 mm. Into the space occupied by the vapour a small quantity of the crystallized potassium oxalate was then introduced. If the chloral hydrate were completely dissociated at 78°, half the observed tension—viz., 58·5 mm.—would be due to steam; but since the dissociation-tension of the hydrate of potassium oxalate at 78° is only 53 mm., the latter would not give off its water of crystallization into the wet atmosphere, and the level of the mercury would remain the same. In the experiment, the introduction of the hydrated salt was followed by a gradual fall of the mercury, till the tension of the mixed vapours had reached 164—*i.e.*, had been increased by 47 mm. Troost concludes that the tension would have increased by 53 mm. if the law of gaseous mixtures were rigorously exact, and that consequently the space occupied by the vapour from chloral hydrate at 78° was *dry*, and no dissociation had taken place.

Würtz immediately repeated these experiments. The quantity of chloral hydrate being so small in Troost's apparatus, the smallest quantity of hygroscopic moisture introduced with the crystals of potassium oxalate would depress the mercury in the tube through a large range. Würtz, being satisfied of the purity of the two hydrates employed, introduced about one-eighth of a grain of chloral hydrate into a barometer tube heated to 100° C. The tension of the vapour was about 370 mm. On passing up well-dried crystals of potassium oxalate, whose dissociation-tension, according to Troost, is 182 mm. at 100°, the mercury fell about 5 mm., and then remained at the same level, although the tube was kept heated for several hours. In a similar tube Würtz made a mixture of air and steam such that the tension of the latter was equal to the tension of the steam in the dissociated vapour from chloral hydrate. On passing up into this carefully-dried crystals of potassium oxalate, a depression of about 4 mm. was observed after an hour. In a third tube containing dry air only at 100°, the introduction of the hydrated oxalate, dried as before, caused a depression of the mercurial column through 80 mm. after two hours and a half. Crystallized potassium oxalate, when free from hygroscopic moisture, does not behave in the vapour from chloral hydrate as it does in dry air, but just as it does in a mixture of air and steam.

(To be continued.)

Correspondence.

[We do not hold ourselves responsible for the opinions expressed by Correspondents.]

THE REVIVIFICATION OF SPENT OXIDE OF IRON.

Sir,—In reply to the letter of Mr. T. D. Hall, in last Journal, as to the unsatisfactory way his oxide has of catching fire, I expect he has had it in action too long (nine months), and it is possible that it is pretty well exhausted, so far as its purifying power is concerned, and I would recommend him to have a fresh supply. It may require to have some sawdust added to it, but I do not find it necessary. It should not be used in too dry a condition, and a little water added to make it something like dry lime should prevent its catching fire. When taken out of the purifier it should be watered and placed in a thin stratum, and kept constantly turned over. I think if Mr. Hall attends to this he will not have any further trouble.

F. J. E.

March 24, 1880.

SPENCE'S METALLIC COMPOUND AND ITS USE FOR PIPE-JOINTS.

Sir,—My attention has been drawn to a reference, in the Journal of the 2nd inst., to a letter written by Mr. R. Morton, of the London Gas-light Company, to the *Journal of the Society of Arts*, on the subject of Spence's metal, and which is, I think, calculated greatly to mislead a numerous class of your readers—*i.e.*, the Engineers of the various Gas Companies in England. As I am much interested in the metal, and have seen a great deal of its working since first it was discovered, I trust you will allow me to make a few remarks thereon.

Mr. Morton says he has, as yet, been unable to obtain a sound joint by its use. I am, of course, ignorant of the conditions under which Mr. Morton made his trial; but I have myself, by permission of the Engineer to the Edinburgh Water Trust, joined several ordinary spigot and socket pipes, running the metal into the joint like lead, only without staving or setting up, and the joints have been afterwards put under the greatest pressure obtainable in the Water Trust yard—viz., 400 feet of water—with a perfectly satisfactory result. This, coupled with the fact that nearly 50 Gas Companies in England continue to use the metal in laying their pipes, makes me wonder whether the fault does not lie with Mr. Morton or his assistants, and not with Spence's metal.

I may add that I was not aware that Mr. Spence or any of his representatives were in the habit of making 4-inch pipes, as the wording of Mr. Morton's letter would lead me to suppose.

J. L. A. Hope.

93, *West Regent Street, Glasgow, March* 23, 1880.

THE RECENT GAS-LAMP TESTS AT BIRMINGHAM.

Sir,—Your last week's correspondent, the defeated competitor, has chosen deliberately to stigmatize as an error the public comparative experiment made at Birmingham on the night of Wednesday, the 10th inst., between my 200-candle globe lantern and burner, No. 9 on Mr. Hunt's list, and the quadruple arrangement of adamas flat-flame burners, No. 10 on the same list. He says, with considerable assurance, "the Wednesday night's error was much more prominently stated [in your report] than the Thursday's correction;" and, at the bottom of his letter, he volunteers the statement, for "the information of those who were not present, that the lateral light only is tested in these experiments."

Against these statements I beg most emphatically to protest; while I consider the motive of the writer is clear, and distinctly contradicts the preface of his letter, which leads one to assume that it is dictated by a desire "that a proper conception may be formed of the instructive experiments," &c.

If I were to permit myself to make use of a short American word which once raised the ire of Professor Tyndall when it was introduced to his notice by Mr. Pope, Q.C., as a convenient mode of concisely expressing his sentiments on a certain question which the Professor thought was surrounded by a great amount of unreality, I should use that word to express my opinion of your correspondent's anxiety in this direction. The trial on the Wednesday night was a public one, of which no notice was given to any of the competitors, and the result showed that my 200-candle Argand burner in a globe lantern gave over 30 per cent. more light, for the same quantity of gas, than the quadruple flat-flame burner against which it was tried. A representative of the Journal and a great many Engineers of eminence assisted at it, and it was not a hurried one. I took no part in it in any way, nor was I present at the trials, although I was on another part of the ground; neither was I aware of the result of the trial till I read it in the Journal. Your correspondent, on the contrary, was there, though I do not suppose he was allowed to take any part in the tests. He, however, evidently knew the results of previous, and probably not so perfect trials, which had been made by Mr. Hunt and his assistants. Naturally these private preliminary trials would not have been communicated to any of the competitors. They were, and must have been, distinctly private trials preparatory to the public one which Mr. Hunt was contemplating; and I would not insult either Mr. Hunt or his assistant, Mr. Colson, by imagining for one moment that information of the results of any of these trials had been given to any of the competitors, for if given to one they would have been given to all. Your readers who know them will, I am sure, cordially concur with me in this opinion. But by his own words your

correspondent betrays himself, for he says: "As the tests hurriedly made on Wednesday night with the two 200-candle power burners and lanterns were not in accordance with *several previous tests* [the italics are mine] made with the same lanterns," &c. And further on, after stating the result of another trial on Thursday night, at which I was not present, neither had any information about, made by Mr. Hunt, and forwarded to you for publication, he says, with the utmost assurance—as of a man who was present, in some way, at them—"This result was in close correspondence with the several previous tests." And yet with all this previous information obtained, your correspondent present at the official public trial, knowing the position of the shadow meter, at that trial, between my lamp and the quadruple one, does not say one word about error until you publish the result. Only then he calls it an error because the trial utterly demolished the statements which he has been making for some time past.

I say there was no error in the experiment of the Wednesday night, because I have made a great many careful tests of my 200-candle Argands, against such a quadruple combination of flat-flame burners as was then exhibited as being of your correspondent's invention, and I am able to corroborate the results of the Wednesday night's trial by these, my own experiments, as well as by the evidence of impartial and competent scientific men, whose results will shortly be given to you. More than this, your correspondent himself admits the truth of the experiment, and "accepts the consequences of having tests made [peculiar phraseology] with our burners of the medium lighting class;" although he endeavours to draw a herring across the trail by subtle explanations of why he makes his burners give from 6 to 12 per cent. less light than they ought to do.

I only say this, that when I saw the quadruple burner just before the trial, it was doing its very best; that it is the same kind of burner I have seen in various places, and is advertised to give the light of 200 parliamentary candles; and that it was tried at the public trial on Wednesday as it is used in the public streets.

Your correspondent's statement, "that only lateral light is tested in these experiments," if true, is only so as regards my 200-candle globe lantern and burner, and most distinctly not as regards the quadruple flame lantern and burner in competition with it. It happens that the only 200-candle lantern which Mr. Hunt possesses is of the globular form, and it was for him, and at his suggestion, that I designed this form. Although it is, in the opinion of many, more graceful than the original 12-sided cone lantern (used first by Mr. Corbet Woodall in the Waterloo Road, and afterwards adopted for Waterloo Place and Queen Victoria Street, London, Sackville Street, Dublin, and many other public thoroughfares in Lambeth and elsewhere), yet it necessarily follows that the rays of light reflected from the semi-circular white glass top fall very near the foot of the post.

During the estimation of the comparative illuminating power, the shadow meter had to be taken away from it, and carried much nearer the inferior light given by the quadruple flame burner. The greased disc was, therefore, out of the reach of these reflected rays from my globe lantern; but the contrary must necessarily have been the case with the quadruple competing burner. The lantern in which it was enclosed was of hexagonal form, similar in its most essential features to my original 12-sided lantern, provided with the now well-known white glass conical reflector, which I trust your correspondent will pardon me for saying I invented expressly for the powerful lamps I brought out in competition with the electric light. This enabled the much talked-of vertical rays from the burner to reach the disc with only the loss due to reflection from this excellent reflector.

Now, in the Wednesday night's trial the quadruple burner was rightly, I think, brought up as nearly as could be done (without an injurious pressure at the point of ignition) to the aggregate number of candles it was said to be able to produce; in fact, it was made to look its best. It, however, certainly did not reach the advertised standard of 200 candles; but when it was turned down, as it probably was in Thursday night's trial, the flame could not have presented the same rigid and brilliant appearance it did on Wednesday night. With a lower aggregate amount of light given, and less brilliancy, the destructive effect of pressure at the point of ignition required to give the flame a good shape was mitigated, and a higher result per cubic foot of gas consumed could be thus obtained, as most of your readers who have tried experiments with flat-flame burners doubtless already know. But the turning-down system, which benefits in one way the over-oxidized flat-flame, has quite the contrary effect upon the Argand burner, which has an almost inappreciable pressure at the point of ignition, and this because the air supply, regulated by the chimney, remains nearly the same, although the gas supply is diminished. If, however, it is desired to use my 200-candle Argand so as to produce a very high amount of illuminating power per cubic foot of gas consumed, I have the authority of Mr. Hunt, who has tried it, for saying that with a shorter chimney and a smaller consumption of gas than that required to produce 200 candles, it is capable of producing the astonishing result in illuminating power of 4·50 candles per cubic foot of 16-candle gas consumed. This is over 30 per cent. more light than that given by your correspondent's extraordinary "high lighting power" 80-candle flat-flame burner, which he does not consider well adapted to its work, neither do I. Mr. Heisch, Gas Analyst to the Corporation of the City of London, has also pointed out in the JOURNAL that, with slightly-increased consumption, the 200-candle Argand develops 4·50 candles to the foot with such gas as is supplied to the City of London.

So that if, in the Thursday night's experiment, the quadruple flat-flame burner, instead of being turned down, had been supplied with sufficient gas to have made it give the aggregate light it is advertised to produce—viz., 200 candles—the pressure at the point of ignition must have been raised, and a lower result per cubic foot of gas consumed than that given in the Wednesday night's trial would have been obtained. But I maintain the trial on the Wednesday night was, as far as I can see, a practical one in every respect; more so than that of the Thursday night. This latter test might also have been made in a manner, having regard to what can be done with a shorter chimney, on the 200-candle Argand, or giving it 50 feet of gas per hour with the same chimney. It would then have only confirmed the Wednesday night's trial.

I now beg leave to inform "those of your readers who were not present" that I exhibited a *real* 200-candle flat-flame burner and lantern of new construction. The burner was a new combination of my patent hollow-top circular slit steatite flat-flame burners, with a central flame and a sub-chimney. The two latter improvements give great brilliancy to the flat-flame burners. The lantern, which is supplied with air and ventilated entirely from the top, in a manner similar to that employed in my Argand lanterns, is provided with a porcelain reflector combined with a white glass reflector. This lamp, sent as soon as ever I heard there was to be a show of lanterns, was too late probably to be put in competition; but the burner of it was tried in the photometer. It gave a higher result, with greater brilliancy, than the quadruple flat-flame burner which was tried against my 200-candle Argand. I will provide you with a drawing of the lamp and burner next week.

Permit me also to observe that, without so loudly expressing my desire that the fullest information should be afforded to your readers relative to the important question of large Argands and large flat-flame burners, I have, at my own expense, and with the kind permission of the Engineer, fitted up a very perfect apparatus for making tests at one of the principal London gas-works. The gas supplied from these works is of that quality which is mostly consumed throughout the world; and for some considerable time past careful experiments have been conducted for me, and at my expense, with various kinds of Argand and flat-flame burners, by highly scientific and practical men, and also, quite independently of me, for his own information, by the Engineer himself. These experiments have now reached such a stage that I believe they can be shortly communicated to you.

In conclusion, I beg to say that, although I distinctly decline to have anything to do with "challenges," I shall continue to give, as I have always done, correct information to your readers of the results which they can obtain from my burners and lanterns. Further than this, if your correspondent can obtain—and I expect he can—the sanction of the Engineer of the works where my photometer is set up, he is welcome, as far as I am concerned, to have any trials made of burners and lanterns of his own invention in competition with my burners and lanterns, which I will send for the purpose, on condition only that he does not interfere with the test, will consent to pay one-half the cost of the trials, and forward to you the results for publication.

I apologize very sincerely for the length of this communication, assuring you that it is only forced from me by the manner in which I feel your correspondent has acted in the matter, and has been acting towards me for some time past.

Vincent Street, Westminster, March 27, 1880. WILLIAM SUGG.

Legal Intelligence.

SUPREME COURT OF JUDICATURE—COURT OF APPEAL.

MONDAY, MARCH 22.

(*Before Lords Justices* BRAMWELL, BAGGALLAY, *and* THESIGER.)

HAWKSLEY *v.* BRADSHAW AND ANOTHER.

Proceedings in this case, which has previously been referred to in the JOURNAL, were continued to-day on an appeal by the defendants from an order of the Lord Chief Justice of England and Justice Manisty. The petitioner, Mr. Thomas Hawksley, was, at the time of the action, the Chief Engineer of the Nottingham Water-Works Company. The defendants, Messrs. W. and A. S. Bradshaw, were printers and publishers of the *Nottingham Journal*. On May 12 last year, defendants printed and published an article which was alleged by the plaintiff to reflect on him in his professional capacity. It was alleged to impute that he was anxious to push forward, with all possible vigour, new works, which were not needful, would probably not be remunerative, and were not *bonâ fide* for the purpose of meeting public wants, or for any purpose consistent with the plaintiff's duty and honour and good character, but for the purpose of unfairly increasing the price of the Water-Works Company's undertaking to the Corporation of Nottingham on behalf of the inhabitants of the town, and for the purpose of increasing the plaintiff's emoluments as the Engineer of the Company, or otherwise, unprofessionally disgraceful and dishonourable. This article was alleged by the plaintiff to be falsely and maliciously printed and published by the defendants. He stated that his character had been damaged, and he claimed £1000 in respect thereof. In their statement of defence, the defendants justified the libel, and paid 40s. into court in satisfaction of the claim. The matter came before the Court below on the pleadings, the question being whether the defendants, having justified the libel, could, as an alternative defence, plead that they had paid into court 40s. in satisfaction under the Judicature Act. It was held in the court below that there was nothing in the Judicature Act which repealed or modified Lord Campbell's (Libel) Act. Before the passing of the Judicature Act, money could not be paid into court when a justification was pleaded, and it would be embarrassing to the plaintiff, to vindicate his character, that he must either take the money out of court, or else have it said that he shirked the trial. They, therefore, ordered the defence to be struck out, and the case to go down for trial on its merits. From that decision defendants now appealed.

Mr. GRAHAM appeared for the appellants, the defendants in the action; Mr. CAVE, Q.C., and Mr. DUNN for the respondent, the plaintiff in the cause.

Lord Justice BRAMWELL, in giving judgment, said that he could not concur with the decision of the Court below. It might be that these pleadings embarrassed the plaintiff, but were not embarrassing in the sense that they were embarrassing him as to the mode of dealing with them. It appeared reasonable to his lordship that these pleadings should be allowed, and he was therefore of opinion that the judgment of the Court below should be reversed.

Lords Justices BAGGALLAY and THESIGER concurred.

The appeal was therefore allowed, with costs.

HIGH COURT OF JUSTICE—CHANCERY DIVISION.

TUESDAY, MARCH 23.

(*Before Vice-Chancellor* BACON.)

ATTORNEY-GENERAL *v.* HILL.

Mr. HEMMING, Q.C. (with him Mr. LANGWORTHY), in opening this case, stated that it was a bill and information by the Mayor, Aldermen, and Burgesses of the borough of Tamworth, and also by William Wileman, on behalf of himself and all the other ratepayers, against the Tamworth Gas-light and Coke Company, who were trustees of shares which they held for the benefit of the ratepayers. The plaintiffs stated that many years ago a subscription was raised for the purpose of relieving the town of Tam-

worth from part of the cost of the public lighting. About £500 was thus raised and invested, in the names of trustees, in shares of the Tamworth Gas Company, the primary object of the trust being that the income should be applied in the reduction of any sums which the inhabitants might have to pay for lighting the town. It seemed to have been contemplated that a time might come when gas would no longer be required, and therefore behind the primary trust it was stipulated that in such event the money should be applied for some other purpose for the benefit of the town. The money was raised as long ago as 1835, and from that time until a year or two since the dividends on the shares were regularly applied for the purposes of the primary trust, being set off against the payments due to the Gas Company. There appeared to have been some uneasiness in the minds of the representatives of the trustees, and in 1839 and 1871 agreements were obtained by which the Gas Company pledged themselves that the dividends on the trust shares should be applied for the purpose of the primary trust. But in 1871 differences of opinion began to arise between the Town Council and the Gas Company; and if the gas-lamps were lighted an hour longer than the Company thought they ought to have been, they immediately charged the Council with penalties. Upon this further disputes cropped up, and in 1873, in rendering their accounts, the Company gave the Council credit for the dividends on the shares, but placed about £30 of penalties on the other side of the account. This they were enabled to do, because, curiously enough, the trustees who held the gas shares had all died but one, who was, or had been Chairman of the Company. Then the Solicitor of the Company thought it was his duty to help his clients, and it occurred to him that, Mr. Bramall, the Chairman of the Company, being a very old man, it would be better to appoint new trustees, and he prepared a deed for the purpose, by which Mr. Bramall assigned the property to new trustees, who were all Directors of the Gas Company. But by that deed power was given to the trustees to apply the funds in any way they thought fit for the benefit of the town. While certain disputes then pending were going on, the Town Clerk wrote to Mr. Shaw, the Company's Solicitor, asking to see the deed which had been prepared; but the answer was that it was a title-deed, and he refused to show it. It was not until after the commencement of the litigation that the deed was produced, and when it was seen, the Charity Commissioners were appealed to, and they suggested that a scheme should be submitted to them, and that an end should be put to all necessity for litigation. To this the plaintiffs assented, but the defendants declined to agree to any scheme, on the ground that a charitable trust was still in existence, and that they were properly administering it. The defendants, by their answer, stated that the gas shares had been solely under the control of the Directors of the Gas Company, and that they had no intention of dealing with the shares in any manner other than that provided by the trust deed. They also submitted for the determination of the Court whether the shares constituted a charitable fund, but were willing, in the event of the Court so holding, to concur in any scheme for the proper application of the fund. The plaintiffs asked for a declaration that the shares should be applied in aid of the rates for lighting the town of Tamworth, and that so far as not required for that purpose they should be applied for the benefit of the inhabitants of the town, and in paying the costs of the suit.

Mr. Medd (with whom was Sir Henry Jackson, Q.C.) appeared for the defendants, and submitted that the trustees ought not to be called upon to pay costs, as the whole of the facts relating to the trust were known to the plaintiffs from the first, and that as the defendants had always been ready and willing to perform the trusts of the deed, the present application was entirely misconceived. The defendants were not responsible for the validity of the deed, and it would be monstrous to call upon them to pay costs in the event of the Court deciding that the deed was invalid, they having simply consented to become trustees upon a proper deed being executed. The defendants had always been willing that the matter should be settled by arbitration, but the plaintiffs would not consent; and yet it was now said all the litigation had been caused by the defendants.

His Lordship said the case was really undefended, because when the plaintiffs asked to see the deed of 1872, which declared the rights of the parties, the defendants peremptorily refused to produce it, and this refusal had led to the institution of the suit. He was of opinion that a public charity had been created, and that the objects of the trust would be frustrated if the costs were allowed to be deducted from the charity. The plaintiffs were entitled to a declaration that the gas shares were applicable to the purposes for which the trust was created, and there would be an order that the deed of 1872 be set aside on the ground of being an improper deed, and that the costs of the suit be paid by the defendants other than Mr. Bramall.

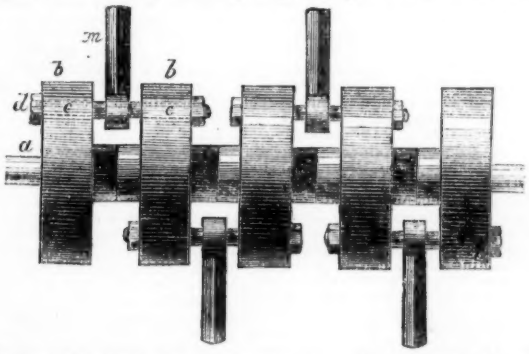
Order accordingly.

Miscellaneous News.

DURAND AND CHAPITEL'S COKE BREAKER.

There is now being fixed, and will shortly be at work at the Kensal Green station of the Chartered Gas Company, one of the above-named machines, which have been extensively introduced in continental works, and are in all cases, we hear, giving much satisfaction. One of the machines has also been in use, during the past winter, at the Crystal Palace District Gas Company's works, Lower Sydenham. There is also one at the South Metropolitan Gas-Works, Old Kent Road.

The machine altogether supersedes the system at present employed for breaking coke—viz., by crushing or pounding it. With it the coke is



broken up almost in the same manner as it would be by hand labour, the breakers proper (see above engraving) being a number of hammers similar to the coke hammers now generally employed in gas-works. The method of performing the operation is, however, entirely different. Instead of the coke being spread out upon the ground, and consequently supported by a solid substance when it receives the blow of the hammer, it is struck, so to speak, in mid-air.

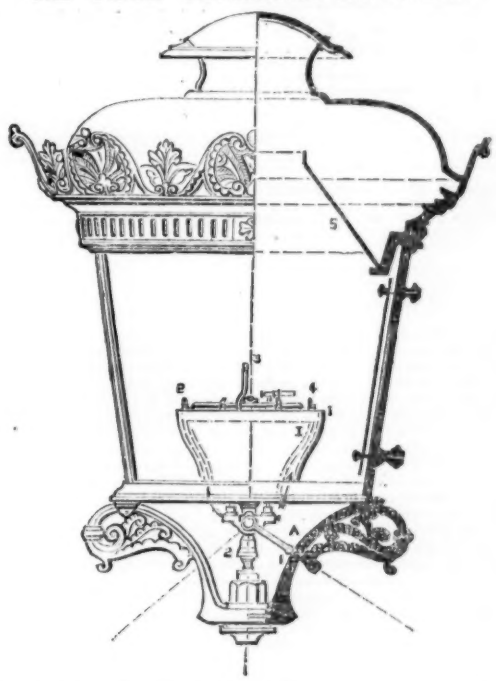
The following brief description of the machine will show how it operates. Upon a horizontal shaft, *a*, are fixed five circular plates of cast iron, *b b*, about 1½ inches apart. A hole is drilled near the circumference of each plate, at *c c*, and a long bolt, *d*, passed through and into a corresponding hole in the next plate, thus binding them together. This bolt carries the hammer, *m*, which is really the principal part of the machine. In a line with the hole in the second plate, and in its outer circumference, there is another hole, through which a bolt is passed connecting it with the third plate, and this bolt likewise carries a hammer. Three plates, therefore, serve for carrying two hammers, so that there are four hammers in each machine. The hammer is, strictly speaking, a kind of flail, made of steel or common cast iron, about ½ inch in thickness, and tapered off somewhat like a hatchet. One of its extremities is formed into a kind of handle, and this is held in position by the connecting bolt, upon which it turns freely; but when motion is imparted to the machine, causing the plates to revolve rapidly, these hammers have the appearance of being fixtures.

A hopper placed above the machine allows of the introduction of the coke, which, in falling, comes in contact with the revolving hammers, and is broken up and projected against a horizontal iron grating, by which the working parts of the machine are surrounded. The space between the bars of this grating may, of course, be regulated at pleasure.

From the foregoing description an estimate may easily be formed of the advantages to be gained by the use of this small apparatus, which weighs only about 7 cwt., and measures 4 feet in length by 3 ft. 3 in. in height. But, though small, its working capacity is very considerable, being equal to the breaking of as much as 230 chaldrons of coke per day. Very simple gearing, worked by a pony, suffices for driving the breaker, and with this motive power it will turn out nearly 4 chaldrons of coke per hour. Any kind of coke—hard or soft, gas or metallurgic—may be broken by the machine, the pieces being of very uniform size (but this, as has been said, can be regulated by means of the grating), with no greater production of breeze and dust than would result from hand breaking. The entire machine is enclosed in a wooden case, and, when worked by hand, turns out about 10 tons of coke per day; worked by a horse, or a 1-horse power gas or steam engine, 20 tons; by a 2-horse power engine, 30 tons; by a 4-horse power engine, 60 tons. Of this, from 90 to 94 per cent. is good coke, the remainder dust.

The machine was awarded a bronze medal at the last French Exhibition. It is being introduced in England by Mr. E. Garey, of the Continental Union Gas Company.

THE "PHARE" GAS LANTERN AND BURNER.



The above is an illustration of the lantern which was placed on the refuge in front of the Mansion House Station of the Metropolitan District Railway, and used for three months ending the 9th inst. The burner it contained was on the principle of those employed for lighting the Rue du Quatre Septembre, Paris. The average consumption of gas by it was, we hear, 380 cubic feet for the time during which it was lighted each night. This would give, on an average, about 28 feet per hour, including the gain by turning out the large series of six jets and lighting the single one; which, however, was only done occasionally, while at times the burner was alight all day.

Mr. Killingworth Hedges, C.E., of Queen Anne's Gate, Westminster, has introduced this burner into England, and has designed an arrangement by which a series of the burners can be turned down from the high to the low power at once. All that is necessary to effect this is a connection with the nearest telegraph wire, through which an electric current could be sent, and thus cause a small magnet to come into action and alter the position of the lever, A. The same magnet might also be arranged to shut the gas off altogether; but it would only be in cases where the burners were fixed at some distance apart, and too far for a man to go round at midnight, as in Paris, that this arrangement would be required.

In the part of the engraving showing the burner, an enlarged view of which was given in the Journal for June 17 last year, p. 942, 1 and 1 are glass cylinders conducting air to the jets; 2 is the circle of six jets; 3 the single jet; and 4 the flash light. The figure 5 in the roof of the lantern shows the position of the reflectors placed therein; while, at the base, A is the lever by which, when it is moved from 1 to 2, the circle of six jets is extinguished, and the single central jet lighted.

CRYSTAL PALACE DISTRICT GAS COMPANY.

The Ordinary Half-Yearly General Meeting of this Company was held at the Albion Tavern, Aldersgate Street, on Thursday, the 25th inst.—Professor ERASMUS WILSON in the chair.

The SECRETARY (Mr. Magnus Ohren) having read the notice convening the meeting, the following report and accounts were presented:—

The Directors report that the general working of the Company during the half year has been satisfactory.

The Directors going out of office by rotation are Dr. F. Hetley and Mr. G. Livesey, who, being eligible, offer themselves for re-election.

The Auditor going out of office by rotation is Mr. J. Glaisher, who, being eligible, offers himself for re-election.

The reports of the Gas Examiners of the parishes supplied by the Company, as to the illuminating power of the gas and its freedom from sulphuretted hydrogen and ammonia, continue to be satisfactory.

The accounts annexed show the financial position of the Company.

The Directors recommend the declaration of a dividend for the half year ending the 31st of December last at the following rates per annum—viz., 6 per cent. on the preference stock; 7 per cent. on the ordinary 7 per cent. stock; 10 per cent. on the ordinary 10 per cent. stock; and 7 per cent. on the new ordinary 7 per cent. shares, all less income-tax. This will amount to £10,634 10s. 4d., and the sum of £1352 1s. will be carried forward to the profit of the succeeding half year.

[The paid-up capital of the Company consists of £50,000 of 6 per cent. preference stock; £125,000 of ordinary 7 per cent. stock; £75,000 of ordinary 10 per cent. stock; and £48,754 10s. of new ordinary 7 per cent. shares. There is £101,245 10s. more of the last description of capital, and £37,500 of loans, authorized to be raised by the Company's last Act of Parliament. The total expenditure on capital account to Dec. 31 was £267,783 8s. 2d., a net addition of £1637 19s. 9d. having been made to it since June. The contingent-fund amounts to £10,000, the reserve-fund to £19,434, and the insurance-fund to £2620. Of these amounts, the whole of the contingent-fund, and £17,547 of the other funds, is invested in Government and other stocks.]

REVENUE ACCOUNT, *for the Half Year ended Dec.* 31, 1879.

Dr.				Cr.		
To Manufacture of gas—				By Sale of gas—		
Coals, including all expenses		£20,106 7 4		Private rental—		
Purifying materials, wages, &c.		859 4 10		Michaelmas quarter—		
Salaries of Engineer and Officers		628 15 9		3,359,000 cubic feet, at 3s. 7d.	£601 16 3	
Wages and gratuities		3,621 12 6		59,302,700 ,, 3s. 9d.	11,147 1 6	
Works, machines, and retorts—maintenance of, repairs, and labour	£5,770 14 11					£11,748 17 9
Less old material	63 16 8			Christmas quarter—		
		5,706 18 3		4,078,200 cubic feet, at 3s. 7d.	£730 12 3	
			£30,922 18 8	139,337,100 ,, 3s. 9d.	26,159 19 5	
Distribution of gas—						26,890 11 8
Salaries of Chief Inspector, Inspectors, and Clerks in Light Office	£767 19 3			206,077,060 private rental, the half year		£38,639 9 5
Mains and service-pipes, repairs, maintenance, renewal, and labour	1,318 15 0			17,397,000 public rental, the half year, on 1805 lamps		3,855 2 9
Meters, regulators, and gas-stoves, repairing and renewing	1,215 8 7			Total 223,474,000 cubic feet sold		£42,494 12 2
		3,302 2 10		Rental of meters		605 1 7
Public lamps—				Total rental		£43,099 13 9
Lighting and repairing		661 14 10		Residual products—		
Rents, rates, and taxes—				Coke, less labour and cartage	£7,949 9 3	
Rents	£23 17 10			Breeze ,, ,,	207 6 11	
Rates and taxes	2,093 8 1			Tar	1,094 10 6	
		2,117 5 11		Sundries	3 9 6	
Management—					£9,254 16 2	
Directors allowances	£750 0 0			Sulphate and ammoniacal liquor, less labour, &c.	2,238 6 10	
Salaries of Secretary, Accountant, Clerks, and Messenger	596 4 10					11,513 3 0
Collectors commission	471 13 10			Rents		97 19 8
Stationery and printing	250 3 9					
General establishment charges	272 13 8					
Auditors	50 0 0					
		2,390 16 1				
Sundries—						
Law and parliamentary charges		320 12 3				
Bad debts		215 4 3				
Insurance-fund		206 10 6				
Horses and carts		30 10 0				
Total expenditure		£40,167 15 4		Total receipts		£54,710 16 5
Balance carried to profit and loss account		14,543 1 1				
		£54,710 16 5				

PROFIT AND LOSS ACCOUNT (NET REVENUE).

To Reserved fund account, amount carried from the half year's profits	£4,000 0 0	By Balance of net profit from last account	£11,745 3 10
Balance of net profit to be carried to next account, subject to half year's dividends to Dec. 31	11,986 11 4	Less dividend paid for the half year ended the 30th of June	10,452 12 1
			£1,292 11 9
		Balance from revenue account, being profit for the half year	14,543 1 1
		Interest on contingent-fund, &c.	150 18 6
	£15,986 11 4		£15,986 11 4

The CHAIRMAN, in moving the adoption of the report, said that since they last met the progress of their undertaking had gone on in the most satisfactory manner, and there had been no occurrence which would render it necessary that he should address them at any length on the present occasion. They were now not only in as good a position as when they last met, but really in a better one. The whole of what the Directors had to say was embraced in a short paragraph at the head of the report. The Directors reported "that the general working of the Company during the half year has been satisfactory." He thought the Shareholders ought to be perfectly contented with the institution with which they were connected. In fact, had it not been for one trifling matter, he could not have ventured to detain them a minute longer. But there was a circumstance to which his attention had been called by the Secretary, which would doubtless be of interest to the Shareholders and deserving of notice, and it was the fact that the present meeting represented the first quarter of a century of the Company's existence. There were some present who knew the Company at its earliest stage, and if they would cast back their thoughts upon that which they had seen and heard in that room, he was sure they would feel their course had been a highly prosperous one. If they were young men instead of being a young Company, they might be classified as being moral, as being steady, as being businesslike, and as being courteous; but as never failing to keep their eyes upon that which was the main object of life—success. He concluded by moving—"That the report as presented, together with the accounts and balance-sheet, be received, adopted, and entered on the minutes."

Mr. J. CURTIS seconded the motion, and it was carried unanimously.

The DEPUTY-CHAIRMAN (Mr. H. P. Stephenson) then moved—"That a dividend for the half year ending Dec. 31 last be now declared, and be payable forthwith at the following rates per annum:—viz., 6 per cent. on the preference stock; 7 per cent. on the ordinary 7 per cent. stock; 10 per cent. on the ordinary 10 per cent. stock; and 7 per cent. on the new ordinary 7 per cent. shares."

Dr. FREDERIC HETLEY, J.P., seconded the motion.

The CHAIRMAN, in putting the resolution, said that the proposed dividend was the highest which the Company were permitted to pay, and he therefore thought the meeting would be quite unanimous in accepting the proposition.

The motion was unanimously carried.

The retiring Directors (Dr. F. Hetley and Mr. G. Livesey) were then re-elected, Mr. J. Glaisher was re-appointed Auditor, and a vote of thanks was passed to the Chairman and Directors for their able management of the affairs of the Company.

The CHAIRMAN, on behalf of himself and his colleagues, thanked the meeting most heartily for the vote, and assured them that no exertions should be wanting on the part of the Board to keep up the prosperity which had attended the working of the Company for so many years.

On the motion of the CHAIRMAN, seconded by Mr. BENGOUGH, a vote of thanks was unanimously given to the Auditors and Officers of the Company for the efficient discharge of their duties.

Mr. A. LAYTON, in responding, said perhaps the Chairman was better able than any one else to know whether the officers deserved the vote. He (Mr. Layton) endeavoured to do his duty, and he was sure that the officers performed theirs in a satisfactory manner, and by means of a great deal of hard work brought matters to a very successful termination at each half year. The balance-sheet showed how prosperously the Company were going on.

A vote of thanks was then given to the Chairman, who briefly responded, and the proceedings closed.

CITY OF ST. PETERSBURG NEW WATER-WORKS COMPANY, LIMITED.

The Seventh Ordinary General Meeting of this Company was held on the 3rd inst., at the City Terminus Hotel—Mr. W. T. WESTERN in the chair—when the report of the Directors stated that the receipts from sales of water had been 80,338 roubles in the year 1879, against 64,020 roubles in 1878. The miscellaneous profits had been 5009 roubles. The local expenses in St. Petersburg had been 59,747 roubles against an estimated amount of 57,500 roubles for the year 1878. The balance of revenue account on Dec. 31 last was 25,600 roubles, or about £3459 sterling. From this had to be deducted for loss on exchange, £877; and for office expenses in London (including Directors fees), £1281; leaving £1301 towards the payment of £6441 due for debenture interest. The balance had been met by a further issue of debentures.

The CHAIRMAN, in moving the adoption of the report, said he imagined that at first sight the Shareholders were a little disappointed with it, as he himself was. He was over-sanguine last year in the expectation of the increase they hoped to have. Still, the accounts showed that they had made progress. The gross receipts for water sold amounted during the past year to 80,000 roubles, against 64,000 roubles in 1878. This was an increase of 25 per cent., which he thought the Shareholders would agree with him was very fairly satisfactory. When he looked into the source from which this increase was derived, he found that it was almost entirely from the supply of water for domestic purposes, the number of services which they had laid on being 565 against 464 at the end of the previous year. The manufacturing supply—from which the Company derived some of their revenue, and hoped to derive a good deal more in the future—showed a very considerable increase in the spring and summer, but had fallen off in the last three months. He did not quite know why this was, but the reason given by the Manager was that he believed it was owing to the cleaning of the canals in the city of St. Petersburg, and the manufacturers had gone back to the canal and taken the water from that source. It was only little better than ditch water, and he felt perfectly sure the Company would get those customers back, as the canal would again very soon become dirty. Of miscellaneous profit they had made something over 500 roubles during the year. This was their profit on work carried outf or people in fittings, and things of that kind. The Directors had done very little during the year in the way of spending capital, and this, he thought, was, so far, tolerably satisfactory. They did not wish to spend more capital than they could help. They had intended

laying down an extension of something over three-quarters of a mile of mains, but the negotiations that had been carried on concerning it fell through. The manufacturers who proposed to take the supply did not give a satisfactory guarantee that they would use the Company's water when the extension was made, and therefore the matter was in abeyance. They had sent out the material, which was good stock when the transaction could be completed. They had been able to diminish the office expenses at St. Petersburg, and they hoped there would be a further saving during the current year. The pumping expenses were naturally higher than in the previous year, the quantity of water delivered into the city being 312 million vedros, against 270 million vedros in the previous year. The Directors had naturally spent more on coals, and somewhat more in wages in the Engineer's department; but, although the amount laid out had been larger, the cost per million gallons of water was less than it was—in the proportion of 53 as against 55—showing that as the work increased it was being done more economically. The most serious item on the debtor side of the accounts was that for loss on exchange. The loss this year was, however, less in proportion than the former year. The exchange had risen about 8 per cent.—from 23d. to 25d.; in fact, it rose to nearly 26d. until the late wretched Nihilist attempted assassination, which had for the moment upset confidence. The exchange had not risen so far, however, as to make it worth while to alter the Directors basis of calculation of 24d. to the rouble. Their assets were worth a little more than this. Reference was made in the accounts to a large number of debentures which had been issued. He had told them the history of this on former occasions. It was the balance of the sum owing to the contractors, and for which promissory notes were given to them. The notes became due, and, according to the arrangements made with them, debentures were issued in payment. The contractors were now the largest debenture-holders in the Company. This left a tolerably clean balance-sheet; there being very few outstanding liabilities except the heavy one for debentures. At the latter end of last year the Company's Manager at St. Petersburg sent in his resignation—not from any dissatisfaction between him and the Company, but simply for the purpose of undertaking business on his own account. In consequence of his retirement, the Directors had made certain arrangements by which Mr. Vernon, who was formerly their Accountant, had been made their representative at St. Petersburg. Mr. Carr, who was the Deputy-Engineer, they had put in charge of the engine department, and the Directors had every reason to believe that he was quite competent to do the work expected of him; and, in case of any difficulty, they had made arrangements by which he could refer to their late Manager, Mr. Mallison, whom they had appointed a sort of Consulting Engineer in Russia. The result of these transactions financially was that the Company would save a very considerable part of the late Manager's salary. With regard to their prospects, he was always very shy of prophesying, but he might mention for the Shareholders information that the receipts for the month of January last showed an increase of 3000 roubles over the corresponding month of the previous year, the figures being 10,500 roubles against 7500 roubles. This was a very fair rate of increase. He had recently visited St. Petersburg, and he was pleased to find a considerable amount of building going on in their part of the town. A new bridge was being made across the river, and this had opened a part of the town which was very inaccessible before, and during last year he was surprised to find how many houses had been built and were in course of erection, all of which would bring revenue to the Company. They had also taken the opportunity of the expiration of some of the original contracts by which they supplied water to a portion of the inhabitants to revise them, and the result of that revision would be an average increase of revenue from each house. The Company were able to raise the rates in almost every case, though in one or two instances the revision entailed a diminution. On striking a balance, however, the Directors found they had been able to raise the rates considerably, which would result in a large addition to the receipts. It was too early in the season to enable the Directors to judge what would be the result of laying on new services during the year, but from the very fair state of the trade of the city, he thought they might look at any rate to something equal to last year. The Shareholders would see a note in the report concerning the debentures of the Company. The Directors arranged, without troubling the Shareholders, for the payment of the interest which became due on them to the 31st of December last; but in July next they would have to provide the capital for bonds falling due, to the extent of about £25,000. The Directors had not yet completed the arrangements as to what was to be done regarding the matter, and, therefore, he merely informed the Shareholders of the fact that they would have to make arrangements about them, and leave it to a future time to say what those arrangements might be.

Mr. W. Sangster seconded the motion.

Colonel Ommanney said he had lately been to St. Petersburg, and had spent two days in going over the Company's works. He need not tell the Shareholders that everything stated by the Chairman and the report was perfectly correct. The works were in good order—in fact, three better sets of engines they could not find anywhere. What was to be looked to was the future of the Company. The debenture interest was, no doubt, heavy in proportion to the share capital, and would take some time to work round. He then referred to the pulling down of many of the wooden houses in the neighbourhood of the Company's works, and to their being replaced by others of a better class, and said this would all lead to the increased use of the Company's water, as the occupants of the wooden houses used to take from the Neva whatever water they required. The neighbourhood of their works was really the only part of St. Petersburg where there was any chance of buildings being erected, and he thought that in a few years the Company would find a very large increase in their rates and in the amount of water used. They had an excellent Manager and Engineer, while their local Director, Mr. Anderson, was most energetic.

The motion was carried unanimously.

The retiring Directors and Auditors were then severally re-elected, and a vote of thanks was passed to the Chairman and Directors, to which the Chairman briefly responded, and the proceedings closed.

CAGLIARI GAS AND WATER COMPANY, LIMITED.

The Ordinary General Meeting of this Company was held on Tuesday last, at the London Offices, 3, Lothbury, E.C.—Erasmus Wilson, Esq., F.R.S., in the chair.

The Secretary (Mr. Rod. Mackay) read the notice convening the meeting, and the following report and accounts were presented:—

The receipts on revenue account for the past year amount to £19,218 1s. 1d., and the expenditure to £8709 1s. 2d., leaving a clear net revenue for the year of £10,508 19s. 11d.

The amount available for dividend, including the balance brought forward from the previous year, as shown in the balance-sheet, is £12,121 3s. 10d., out of which an interim dividend at the rate of 5 per cent. per annum was paid for the half year ending June 30, 1879, £3631. The Directors recommend a dividend at the rate of 8 per cent. per annum for the half year ending Dec. 31, 1879, amounting to £5325 12s., leaving a balance of £2664 11s. 10d.

The water receipts for the year show an increase of £226 over those of the previous year.

The gas receipts, from public and private lights, for the year, show an increase of £94. The loss from gas leakage has averaged 7¼ per cent. of the make over the whole year.

After reducing the expenditure on capital account by £1000, as mentioned in the last annual report, the amount now stands at £151,889 8s. 4d., and the Directors recommend that the sum of £1000 be now carried from the revenue balance further in reduction of the capital expenditure account.

The Directors retiring by rotation are Mr. J. Orwell Phillips and Mr. Joseph Quick, who, being eligible, offer themselves for re-election.

Dr. *Revenue Account, for the Year ending Dec. 31, 1879.* Cr.

Maintenance of water-works—				Water—		
Reservoirs and filters in Corungui	£92	1	4	The Italian Government, Province of Cagliari and Municipality of Cagliari. .	*£9,600	0 0
Main to town	54	8	8	* By the 11th Article of the Concession, the fixed annual payment for the water supply in Cagliari is:—For the first 30 years, from 1867 to 1897, £9600; second 30 years, from 1897 to 1927, £7600; third 30 years, from 1927 to 1957, £5600.		
Reservoirs and mains in Cagliari	155	3	5			
Horse keep & miscellaneous	229	6	2			
Gas manufacture—						
Wages	681	2	9	From sundry customers, viz.—		
Coals	1,766	0	2	For extra supply in Cagliari	1,729	1 8
Stores	313	8	1	For supply beyond Cagliari	1,120	13 0
General charges in Cagliari—				Ditto to shipping	159	19 6
Salaries	1,230	1	3	Gas—		
Office rent, stationery, travelling expenses, &c.	234	14	3	Public lamps	1,926	7 5
Rates and taxes in Cagliari	1,043	7	7	Private lights	2,591	3 1
General charges in London—				Products	1,470	9 8
Directors and Auditors fees	281	10	0	Transfer fees	2	7 6
Salaries and office rent	250	0	0	Sundry work and sales of material	617	19 3
Stationery, bill stamps, and petty disbursements	26	5	0			
Prem. on insurance of works	30	0	0			
Exchange on remittances	1,593	5	6			
Interest and discounts	478	7	0			
Sinking-fund	150	0	0			
Reserve-fund	100	0	0			
Total expenditure	£8,709	1	2			
Balance	10,508	19	11			
	£19,218	1	1		£19,218	1 1

Capital Account and Balance-Sheet.

Gas and Water-Works—				Capital, authorized by Memorandum and Articles of Association, 7500 shares of £20 each	£150,000	0 0
Total amount expended, including preliminary expenses, to Dec. 31, 1878, per last account	£152,547	6	5			
Less, written off in last annual report	1,000	0	0	7282 shares, subscribed to Dec. 31, 1879	145,640	0 0
	£151,547	6	5	Debenture bonds	7,500	0 0
Expended during year	342	1	11	Sundry debts due by the Company	967	3 6
Cash at Company's Bankers, London	636	19	4	Bills payable	190	18 7
Cash at Cagliari	39	0	4	Sinking-fund	2,669	7 3
Sundry debts due to the Company	7,129	16	6	Special reserve-fund	556	6 5
Bills receivable on hand	444	19	9	Revenue account, net profits—		
Special works executed	2,166	9	8	Balance, at Dec. 31, 1878	£12,042	13 11
Stores on hand at Cagliari—				Less divs. paid for the year 1878	9,430	12 0
Coals	382	11	10		£2,612	3 11
Products	144	13	10	Less written off to credit of capital expenditure per last annual report	1,000	0 0
Investment in share capital of Company (sinking-fund)	2,640	0	0		1,612	3 11
Do. do. (special reserve-fund)	540	0	0	Year to Dec. 31, 1879	10,508	19 11
Payment on account of dividend, Oct. 6, 1879	3,631	0	0			
	£169,644	19	7		£169,644	19 7

The Chairman, in moving the adoption of the report, said he was not ordinarily given to congratulation, but he believed he might on this occasion congratulate the Shareholders and the Company on their very satisfactory progress. If he wanted any illustration of their success, and of the confidence which was placed in the Board, it would be found in the fact of so small a number of the Shareholders being present. In looking over the report, it would be seen that it was altogether of a satisfactory character, and the Directors trusted the progress which the Company had heretofore made would be steadily continuous. As a provision for this steady continuance, they had suggested some wholesome recommendations as to the disposal of the existing balances. In one paragraph of the report it was stated that the water receipts for the year showed an increase over those of the previous year; in another, it was stated that the gas receipts from public and private lights likewise showed an increase; while, in a third, it was pointed out that the leakage had very considerably diminished over what it had been previously, and was reduced, in fact, to such a minimum that it could not reasonably be objected to. The Shareholders would see also that, as to the disposition of their net income, after providing for a dividend for the year of 6½ per cent., they were enabled to carry forward a balance which permitted them to reduce the expenditure on capital account by £1000. Under these circumstances, he thought they must all agree that the Company and its affairs were in a very wholesome condition.

Mr. J. Orwell Phillips seconded the motion, and it was carried unanimously.

On the motion of Mr. H. P. Stephenson, seconded by Mr. John Aird, the following resolution was also unanimously passed:—"That the interim payment on account of dividend of the 6th of October last be and is hereby confirmed, and that a dividend for the half year to Dec. 31, 1879, at the rate of 8 per cent. per annum, less income-tax, be declared, payable on and after April 5, 1880."

The Chairman then proposed the re-election of Mr. J. Orwell Phillips as a Director of the Company. In doing so he said Mr. Phillips was so well known to every one connected with gas undertakings, and so thoroughly informed on every matter relating to that special enterprise, that he was a most valuable Director of the Company, and it was with much gratification that he (the Chairman) proposed his re-election.

Mr. J. J. Barrow seconded the motion, and it was carried unanimously, as was also one for the re-election of Mr. J. Quick, the other retiring Director.

Mr. Phillips briefly acknowledged, on behalf of himself and Mr. Quick, the compliment paid them.

The retiring Auditors, Messrs. Cox and Bishop, were then re-elected, and a vote of thanks to the Chairman and Directors, for the able manner in which they had conducted the affairs of the Company, was passed unanimously.

The Chairman, in responding, assured the Shareholders that the Directors had most entirely at heart the success of the Company. They spared no effort in order that it might be made a thriving concern, and if it did not become one of the leading companies in connection with the supply of gas and water, it would be only because the city the Company had to supply was limited alike in population and in extent.

The proceedings then terminated.

OTTOMAN GAS COMPANY, LIMITED.

The Annual General Meeting of this Company was held at the London Offices, 53, Cannon Street, E.C., on Tuesday, the 16th inst.—E. Horner, Esq., in the chair.

The Secretary (Mr. A. J. King) having read the notice convening the meeting, the following report and statement of accounts were presented:—

The Directors herewith present the audited statement of accounts for the year ending Dec. 31, 1879.

The gas-rental for that period amounts to £7120 5s. 6d., and the net profit (after paying interest on debentures) to £2508 19s. 9d., which, added to the balance brought forward, makes the sum of £3160 17s. 10d., which the Directors propose to deal with as follows:—

A dividend of 7 per cent. on the preference shares		£574	17 9
A dividend of 3 per cent. on the ordinary shares		1500	0 0
To write off from the preliminary expenses account		500	0 0
Leaving a balance to carry forward of		586	0 1
		£3160	17 10

And resolutions will be proposed at the general meeting accordingly.

The Directors retiring in due course are Edward Horner, Esq., and Stephenson Clarke, Esq., who offer themselves for re-election.

The Auditors, George Allin, Esq., and Charles Butt, Esq., offer themselves for re-election.

Balance-Sheet, Dec. 31, 1879.

Dr.				Cr.			
Capital	£50,000	0	0	Plant	£45,648	18	8
Do., preference shares, viz.—				Concession and preliminary expenses	12,000	0	0
1125 shares, £5 paid	5,625	0	0	Amount owing for public lights	2,270	12	5
900 shares, £3 paid	2,700	0	0	Sundry debtors	3,434	3	8
	£58,325	0	0	Stocks	5,146	18	3
Debentures	1,750	0	0	Office furniture	60	0	0
Sundry creditors	5,902	7	1	Cash	577	11	11
Profit and loss account—							
Amount brought forward	651	18	1				
Add for 1879	2,508	19	9				
	£69,138	4	11		£69,138	4	11

Profit and Loss Account, for the Year ending Dec. 31, 1879.

Cost of coals	£2,456	17	7	Gas-rental	£7,120	5	6
Wages and materials	985	8	0	Products	1,297	1	4
Salaries and office expenses, Smyrna	1,199	1	5	Net profit on chandeliers, fittings, meter-rents, &c.	560	12	2
Bad debts and allowances	74	8	6	Transfer fees	1	0	0
Exchange	419	7	0				
Repairs and renewals	357	7	1				
Debenture interest	105	0	0				
Directors fees	300	0	0				
Interest and discount	131	8	6				
Income-tax	66	12	5				
Rent, salaries, and office expenses, London	344	8	9				
Balance (profit)	2,508	19	9				
	£8,978	19	0		£8,978	19	0

The Chairman, in moving the adoption of the report, said the Shareholders would perceive that the accounts did not very materially differ from those which the Directors had presented before. This fact was, in some measure, satisfactory, seeing that the Company had suffered somewhat of a blow during the past year by the loss of the public lights, for which petroleum had been substituted, in the first circle of Smyrna—the Turkish quarter—the Company retaining the lighting of the second circle, or European quarter. It might not unnaturally have been imagined that this would have very materially affected the profits of the concern, but such was not the case, for the Company had not been affected very much. Even in their misfortune, they had some satisfaction in knowing that for the 200 odd lamps they had lost, something like 800 petroleum lamps had been required to light the place, and even with this number the lighting was not anything like so efficient as before, when the locality was illuminated by means of gas. When a very violent wind occurred, too, a large number of the petroleum lamps were extinguished, and he understood that on one occasion they were all blown out with the exception of 100. He believed it was a notorious fact that the new system of lighting was a job. Certain parties were largely interested in the sale of petroleum, and by this means it had been introduced, but he very much doubted whether the actual cost of lighting was not now quite as much as, if not more than when gas was used, inasmuch as, though the cost per lamp was less, the number of lights being two or three times as great as before of course increased the cost. He therefore thought it likely that a return to the former condition of things would take place. They were in negotiation for such an extension of the lights at the other end of the town as would bring up the number of the public lamps to as many as before. A certain extension of mains would be required, but the Company had the pipes in stock, so that it would necessitate a very small expense indeed to increase the lights. At the next meeting, therefore, he hoped the Directors would be able to report that they had not only as many lights as before, but rather more than that number, and he also hoped the Company would get back those they had lost, and thus be placed in a better position than that which they formerly occupied. The state of the accounts was almost unchanged. There had been an increase of £200 in the capital, in consequence of a Proprietor having fully paid up his preference shares. On the other side of the account, the concession and preliminary expenses had been reduced by £500—on the same scale as before. The result was that the net profit for the half year was £2508, which enabled the Directors to recommend the same dividend as the last, and to carry forward £586. Looking at all the circumstances, he therefore thought the report was very satisfactory, after such a disagreeable occurrence as the taking from them of part of the public lights.

Mr. A. J. Dove seconded the motion.

Mr. R. H. Jones wished to point out that the Company were scarcely in a position to write off £500 from the preliminary expenses account out of the profits of the past year, inasmuch as the net profit was £2508, and the Directors proposed to pay dividends amounting to £2074 17s. 9d. There was, therefore, not quite sufficient to wipe off the £500, except by trenching on their past profits. This, however, was quite a justifiable thing to do.

The Chairman said the difference was so very small, seeing that the Company had a balance of £586, that he thought there could be no objection to their still pursuing the course they had hitherto followed, which he believed every one would admit was a very safe one.

Mr. G. W. Smith said, as the Company were undertaking the public lights again, he supposed they were taking a different course to that which they took on a former occasion, when they sustained such a large loss by the Municipality of Smyrna.

The Chairman said he thought the people of Smyrna now knew very well that what the Ottoman Gas Company said they would do they *would* do. Mr. Muriel, who was there some years ago, established a character for fixity of purpose, and it was known very well that if they said they would cut off the public lights they would do so. Ever since then they had been paid pretty regularly. He believed it was a saying—he knew it was among the mercantile community—that the only concern which was paid in Smyrna was the Ottoman Gas Company.

Mr. D. Burton said they paid £500 every year off the preliminary expenses, but what became of the money?

The Chairman replied that the plant kept on increasing, and if the Company had not obtained money from this source, they would have had to raise more capital. The Secretary, too, reminded him that they had paid off with this money a very large amount of the debenture debt. By doing this they virtually reduced the charges on the concern.

The motion was put, and carried unanimously, and the dividends recommended in the report were declared.

The retiring Directors and Auditors were then severally re-elected, and a vote of thanks was passed to the Chairman and Directors for their services during the past year.

The Chairman, in responding on behalf of himself and the Directors, expressed his acknowledgments for the compliment paid them by the Shareholders. Certainly their work was easy now compared with what it used to be. He hoped by degrees the Company was floating into a better state of things, and that the time would come when the Proprietors would get some better return on their capital than they at present received. He would take this opportunity of saying how much was due to their Engineer and Manager at Smyrna—Mr. H. W. Andrews—who was a very able and zealous servant, and indeed was everything the Company could hope to have. With his attention and resources they would no doubt eventually be in a better position than they were at present.

The proceedings then terminated.

SHEPPY GAS COMPANY.

The Annual General Meeting of this Company was held on Wednesday last—Mr. J. Cole in the chair.

The Secretary (Mr. A. W. Marks) read the following report of the Directors:—

The works and plant have been carefully maintained in a thoroughly efficient state, all necessary repairs having been carried out as the occasion for them arose. A new storeage-tank for ammoniacal liquor has been constructed, and the old heat-shaft, which had become dangerous, pulled down and rebuilt.

There has been a further increase in the gas-rental, and the reduction in price for prompt payment has given much satisfaction to consumers generally. The local sale of coke, for domestic use, has been considerably augmented, and good prices have been secured for other residuals.

The reserve-fund account has been increased by the addition of the surplus profit on the first half of the year, and now stands at £2274 9s. 4d. With a view to the investment of a portion of this amount, it has been deemed advisable to invite the Proprietors of the 419 B* shares to pay up the uncalled £3 per share, and it is proposed that the sum thus raised should be at once invested in securities which can be immediately realized at any time.

The Directors recommend that dividends be declared at the usual rates for the second half of 1879. These, with the November dividends, will complete 4 per cent. upon the A shares, and 10 per cent. upon the B and B* shares, for the year.

Payment of the ordinary dividends will leave an unappropriated balance of profit of £241 9s. 7d., which it is proposed to deal with as follows:—When the profits of the Company were reduced for several years by the high price of coals, there remained back dividends unpaid, but due to the Shareholders when earned, equal to 5 per cent. upon the B capital. That is, 1 per cent. for 1872, 1 per cent. for 1873, 2 per cent. for 1874, and 1 per cent. for 1875; since which year the maximum dividends have been paid. Taking advantage of the recent prosperity of the Company, the price of gas for prompt payment has been twice reduced. The last reduction represents an abatement to consumers of over £600 per annum. The consumers have thus had the first advantage from the improved condition of the business of the Company. Under these circumstances, the Directors now feel themselves warranted in recommending the payment, out of this year's surplus, of the back dividend of 1 per cent., due in respect of the year 1872, such dividend to be paid with the ordinary one, and the remaining balance to be carried to the reserve-fund account.

A vacancy in the directorate, caused by the retirement of Mr. H. G. Clarkson, has been filled up by the election of Mr. S. G. Elliott. The retiring Directors this year are Messrs. G. Lockyer, A. J. Hearn, and S. G. Elliott, who, being eligible, with the Auditor, Mr. E. W. Brightman, offer themselves for re-election accordingly.

Trade Account for the Year 1879.

Dr.				Cr.			
Coals	£3186	17	11	Gas-rental	£7154	19	4
Purifying	35	16	5	Meter-rents	142	16	1
Wages on manufacture and distribution	872	11	0	Fittings and stove hire	76	16	7
Directors fees	100	0	0		£7374	12	0
Auditor's salary	15	0	0	Less discount	431	6	2
Secretary's commission	277	8	0		£6942	15	10
Manager's salary	200	0	0				
Rent, rates, and taxes	264	4	5				
Stationery, stamps, and incidentals	60	12	6				
Repairs, renewals, tools, and stores	515	8	8				
Retort account	250	0	0				
Bad debts	50	0	0				
Coals for sale	31	10	0				
Gas-fittings and labour thereon	213	14	3				
Repair of roads, &c.	25	0	0				
Interest	135	5	7				
Profit on first half year	1210	0	3				
Profit on second half year	1308	12	7				
	£8752	1	7		£8752	1	7

Coke, tar, and liquor produced	£1556	13	1				
Less cartage paid	95	17	4				
	1460	15	9				
Coals sold at works	35	11	0				
Water sold at works	2	11	3				
Gas-fittings	274	17	6				
Transfer fees	2	1	6				
Rent charges	11	5	0				
Rent of garden plots	17	2	3				
Miscellaneous	5	1	6				

The Chairman, in moving the adoption of the report, said it was a matter for congratulation that the Directors were enabled to put before the Shareholders so good a balance-sheet. The report fully explained the working of the Company during the past year, and it needed scarcely any remarks from him to commend it to their favourable consideration. The works and plant were in good condition, which had enabled the Company to meet the improved consumption without materially adding to their expenses. A new storeage-tank had, however, been constructed. The gas-rental had gone on increasing, thus showing that the plan adopted by the Company of encouraging the prompt payment of accounts met with the approval of the majority of the consumers, and it had also been the means of getting in the money with more regularity. The coke trade had improved, and the increase which had taken place in the fittings and stove hire was no small item in the accounts, and added considerably to the prosperity of the Company. With respect to the dividends, the Directors not only recommended the declaration of the usual amounts as in former years, but also that a portion of the back dividends, which, owing to the high price of coals, had to be reduced, should be paid. They, however, thought it was not desirable to pay more than 1 per cent. additional upon the present occasion, and looking at the fact that the price of gas had been twice recently reduced, he did not think that consumers would have any cause at all to complain if this course were adopted. At former meetings considerable discussion had taken place with respect to the reserve-fund, the contention being that it ought to be invested, instead of remaining in the hands of the Company. The Shareholders had been quite right in directing attention to this matter, but up to the present time the Directors had not seen their way clear to carry the suggestion into effect. They now, however, proposed to call the remaining £3 due upon the 419 B* shares, with the view of investing the amount so obtained in securities which could be immediately realized, so that in the event of any accident occurring at the works, the Directors would have a considerable sum to fall back upon. The working capital would still remain sufficient to carry on the business of the Company, even should it go on increasing in the same ratio as it had done during the past few

years. The affairs of the Company were never in a better condition than at the present time, and those persons who were in the habit of buying and selling their shares, well knew how favourably they were looked upon by capitalists. This gave him much pleasure, as it showed that the Company was regarded as a sound investment. The Shareholders would no doubt give their hearty support to the adoption of the report, which, in his opinion, could not be considered as any other than an eminently satisfactory one.

Mr. HAYMEN seconded the motion.

In answer to Mr. Jacobs, the CHAIRMAN said the Directors proposed to invest the reserve-fund in Government securities. The amount realized by the call upon the holders of B* shares would first of all be paid into the London and County Bank, where it would remain at interest until the Funds were somewhat lower.

Mr. HAYMEN suggested whether, seeing the Company now had the money in hand, it would not be as well to pay off the £3000 mortgage on the works.

The CHAIRMAN explained that their Act required the investment of the reserve-fund in some good security, which could not be done if the mortgage were paid off. The fund could not be touched except in case of an explosion, or some such misfortune happening to the works.

After some further conversation, in which the proposals of the Directors as regarded the reserve-fund were fully endorsed, the motion was put, and carried unanimously.

On the motion of Mr. FILMER, seconded by Mr. BRETT, the dividends recommended in the report were declared.

The retiring Directors and Auditor were severally re-elected, and the customary votes of thanks having been accorded to the officials of the Company, the proceedings closed with the usual compliment to the Chairman.

BRISTOL WATER-WORKS COMPANY.

The Annual General Meeting of this Company was held on Saturday, the 20th inst.—Mr. F. FRY in the chair.

The SECRETARY (Mr. A. J. Alexander) read the notice convening the meeting, and the Directors report, which was as follows:—

The revenue from the water-rates for the year 1879 was £62,809 16s. 8d., being an increase of £1959 10s. 10d. over that of the previous year. The sum shown by the revenue account annexed to be applicable for dividend is £17,998 10s. 4d., and the Directors recommend that a dividend of 5 per cent. on the ordinary £25 and £20 shares be now declared. This, with the intermediate dividend of 5 per cent., will make the dividend for the year 10 per cent., and leave a balance of £1319 11s. 2d., out of which the Directors recommend payment of 2s. 6d. per share to the Proprietors of the ordinary £25 shares, on account of arrears of dividend, and leave £319 11s. 2d. to be carried forward.

The estimated value of the premiums on 322 £6 and 109 £4 10s. ordinary shares, for which credit was taken in the accounts of the previous year, has been realized by the sale of the shares on the market at £4 7s. 6d. and £3 7s. 6d. premium respectively, and the proceeds (£1776 12s. 6d.) are now added to the reserve-fund.

The increase of the revenue is satisfactory, notwithstanding that there has been a large falling off in the amount of rates payable for water supplied for building purposes.

The new engines at the Victoria pumping-station have been in constant work since the 16th of September last, and the stand-pipe on Durdham Down is completed and in use. These important works not only add to the efficiency of the service in the high-level districts, but place the Company in possession of a duplicate system for supplying water to Clifton, whilst the more economical working of the new engines is expected to lead to a saving of expenditure at this station. At Chelvey the new engines are at work, and, with the completion of the chimney now in course of erection, the contemplated works will have been virtually carried out.

The capital expended during the past year was £20,398 2s. 2d., and the length of main laid about six miles.

The Engineer, Mr. H. W. Pearson, reports that the works are in good condition.

The retiring Directors are Mr. Leech, Mr. Jones, and Mr. Fuidge, who are eligible, and offer themselves for re-election. The retiring Auditor is Mr. Grace, who offers himself for re-election.

[The authorized capital of the Company consists of ordinary and preference shares, mortgage bonds, and debenture stock, &c., to the amount of £773,326 19s. 1d. There had been expended on capital account on Dec. 31, 1878, £752,928 16s. 11d.; expended in the year ending Dec. 31, 1879, £20,398 2s. 2d.—total, £773,326 19s. 1d.]

Dr.—*Revenue Account, for the Year ending Dec.* 31, 1879.

Dec. 31, 1878—					
To Balance of revenue account to this date			£17,088	16	4
Less dividend paid, April 15, 1879	£15,479	16 3			
Less paid April 15, on account of arrears of dividend	1,000	0 0			
			16,479	16	3
					£609 0 1
Dec. 31, 1879—					
Water-rates					62,809 16 8
Rents					505 2 6
Transfer fees					28 12 7
					£63,952 11 10

Cr.—*Revenue Account.*

Dec. 31, 1879—			
By Office and engineering expenses—			
Salaries	£1,919	8 0	
Printing and advertising	223	6 10	
Incidentals and sundries	518	16 11	
		£2,661	11 9
Collector's commission		1,559	19 3
Pumping at Chelvey		393	9 7
Expenses of working Victoria engine and maintaining Victoria, Durdham Down, Bedminster Down, Leigh and Knowle reservoirs		1,153	8 3
Wages to men in charge of reservoirs and works in the country, repairs, and maintenance		395	12 4
Wages to turncocks		996	6 2
Rates and taxes		4,450	8 2
Repairs		738	8 7
Directors remuneration		800	0 0
Auditors fees		42	0 7
Interest on debenture stock		3,840	0 0
Interest on loans		356	8 8
Interest on preference stock to June		2,500	0 0
Interest on preference shares, 1862		3,600	0 0
Interest on preference shares, 1865		3,600	0 0
Retained to pay half a year's interest on the preference stock to December		2,500	0 0
Balance		34,449	19 1
		£63,952	11 10

The CHAIRMAN, in moving the adoption of the report, said he had little to add to what was stated therein. The silent streams of pure water pervading the city and suburbs were proofs of the importance and the usefulness of the supply afforded by the Company, and every year it became more and more an established necessity—a part of the daily life of their great city. This was proved by the Company having during the past year laid on connections with a larger number of houses than in any former year, and it gave good evidence of the soundness of the undertaking. The net receipts from water-rates had not been so large as in some former years; but this might be attributed to the bad times, for though the Company had laid on domestic supplies equal to about £2800 of rental, they had lost about £800 in diminished receipts from buildings and some other sources. But this substitution of one class of rental for another, though of no pecuniary advantage during the past year, gave the Company a comparatively certain for an uncertain source of revenue, and he thought the Shareholders might hope that the receipts for water for building purposes would again improve. The expenses showed some increase, which was consequent on a growing concern. As stated in the report, the new works were nearly completed. The new engines at Victoria furnished more power, and by means of this the water was lifted over the top of the stand-pipe at the Durdham Down reservoir; and the additional pressure gained thereby would, no doubt, be an advantage to the high-level district.

Mr. C. J. THOMAS seconded the motion, which was put and carried unanimously.

Mr. NAISH said he found that in the balance-sheet there was an item of £4485 as a reserve-fund, which he considered to be a rather small amount for an undertaking having a capital of three-quarters of a million. He believed the Company's reserve-fund was only about five-eighths per cent. upon their capital stock. Of course there must be considerable wear and tear of machinery, and he had heard a gentleman, who was practically acquainted with the subject, say that even the pipes underwent a process of deterioration. He therefore thought the Company should have a more adequate reserve-fund than they had at present.

The CHAIRMAN said the reserve-fund could only be increased by taking money from the dividend, and he did not think it was desirable to do that. Everything at the works was kept in good order, and when repairs were required they were attended to, though very little was needed.

Dividends for the half year ending Dec. 31, 1879, at the rate of 5 per cent. on the £25 and £20 (£14 paid), and on the £6 (£3 paid) and £4 10s. (£2 10s. paid) ordinary shares, and a further dividend of 2s. 6d. per share on the £25 ordinary shares, towards making up the deficiency of previous dividends, were then declared.

The retiring Directors and Auditor were unanimously re-elected, and a vote of thanks having been passed to the Chairman, the proceedings closed.

THE METROPOLIS WATER-WORKS PURCHASE BILL.

During the recent discussions on Mr. Cross's Bill for the purchase of the London Water Companies undertakings much misrepresentation was indulged in when comparing the terms at which the Birmingham Corporation acquired the water-works supplying the town, and those proposed in the above-named Bill. We therefore reproduce two letters which have recently appeared in one of the Birmingham newspapers, setting forth the facts of the Birmingham purchase, and how it compares with the one proposed for London; and we do so the more readily as the first letter controverts the statement that is so frequently made that the Birmingham Corporation Water Act of 1875 sanctioned a *compulsory* purchase of the water-works.

The first letter, published in the *Birmingham Daily Gazette* of the 24th inst., is from Mr. Henry Hawkes, of Northfield, who was Chairman of the Purchasing Committee up to the time when the Birmingham Water Bill, 1875, had passed the second reading in the House of Lords. In it he says: "In 1851 the Town Council took parliamentary power to buy, and for the Water-Works Company to sell their undertaking. On Dec. 4, 1874, a Committee of the Council was formed to prepare a Bill accomplishing this object, and to transfer the property to the Corporation, and the maximum purchase-money inserted therein was £1,000,000. On Feb. 26, 1875, I, as Chairman of the Corporation Committee, stated to the ratepayers in the Town Hall the objects of the Bill, and the anticipated price; and, thereupon, the ratepayers, by resolution, sanctioned such Bill. The measure came before the Select Committee of the House of Commons (of which Mr. W. H. Gladstone was Chairman), and it was opposed by the Water-Works Company on the ground that the power to purchase, acquired by the Corporation in 1851, had become obsolete; but, on the Parliamentary Committee intimating a desire to hear evidence on the question of price, the Company withdrew from further opposition, reserving such opposition for the House of Lords. On the 14th of June the Bill came on for second reading in the House of Lords, and its rejection was moved by Lord Hampton. I had the honour, in company with Mr. George Dixon and the Town Clerk, to place the case of the Corporation before the Duke of Richmond, Earl Granville, Lord Aberdare, Lord Lyttelton, Lord Leigh, and other peers; and, after some discussion in a full House, the second reading was carried. The next day I retired from the Committee and left the Council.

"Subsequently the Bill came on before a Special Committee in the House of Lords, presided over by Lord Penrhyn. The price named in the original Bill was now altered to £1,100,000, and Sir Edmund Beckett, the leading counsel for the Corporation, on the 20th of June, addressing the Lords Committee, accounted for the alteration in these words: 'What I said to the Corporation was this: Put in the very highest price that can reasonably be asked; it is desirable to put in as high a price as you can; and, if you put in a sufficiently high price, the Company may be content with it.' But, unfortunately, on the 6th of July, the Lords Committee came to the following decision:—'The Committee have come to the decision that, in consideration of the Birmingham Corporation having in the year 1854 obtained an Act enabling them to purchase the works of the Water-Works Company, they will pass the preamble of the Bill, giving the Corporation the power under these circumstances of acquiring the works of the Company; but the Committee will take care, in going through the clauses, that there shall be a stipulation to secure to the Company the full and fair value of the works.' The only contention which then remained to be disposed of was the price to be paid, and evidence was adduced to show that 'the capital of the Company is £756,000, whereof the following sums have been paid—viz., (1) £420,000 entitled to a maximum dividend of 8 per cent. per annum; (2) £201,600 entitled to a maximum dividend of 7 per cent. per annum; and the aggregate maximum dividend on the paid-up share capital is £47,712 per annum.' But all efforts to fix the sum failed; and the Lords Committee inserted a clause referring the price to arbitration under the Lands Clauses Act, 1845, unless the parties could agree.

"In my opinion this decision was tantamount to a defeat of the Bill, as, of course, it was always competent for the Company and the Corporation to agree to terms of purchase without being interfered with by Parliament, and I think, upon this decision having been arrived at, the Town Council should have withdrawn the measure; or, at any rate, it should never have been proceeded with before another meeting of the ratepayers in the Town Hall had been afforded an opportunity of rescinding their resolution of the 26th of February. This course, however, was not taken, and the Bill received the Royal Assent on the 2nd of August. The Town Council refused to submit the price to arbitration, and deputed Mr. J. Chamberlain to agree to terms with the Company. That gentleman and the Chairman of the Company at once fixed the sum of £1,362,275, representing the capitalized value, at 4 per cent., of £54,491 perpetual annuities for the purchase, it being borne in mind that the paid-up capital of the Company was only £756,000.

"In introducing the Corporation Bill to Parliament, Sir Edmund Beckett urged its adoption on the ground that the consumers would pay less for their water. His words were, 'You have, first of all, the saving of annual income in the variety of ways which I have been pointing out; you have the saving of prospective profits to the Water Company, and

you have, further, the fact, as a matter of experience, that in the great number of towns where the Corporations have gradually acquired the water-works, in most cases the rates have been reduced. . . . If the Corporation have the works and have the profits, *they must reduce the rates.*' The works came into the hands of the Corporation on the 1st of January, 1876, and now, after the lapse of four years, I find the prices charged have not been lowered, but in many instances have been increased; and I observe that the Corporation has taken power to borrow additional sums of money, amounting to several hundred thousand pounds, in order still further to increase the capital account."

The second letter, dated the 24th inst., is from Mr. J. Satchell Hopkins, of Edgbaston. It was published last Saturday, and is as follows:—

Sir,—I do not purpose entering into the question discussed by the Borough Coroner in his letter which you print to-day—viz., the merits of the bargain made with the Birmingham Water-Works Company. There is, doubtless, much to be said in favour of the purchase of that Company, even on the terms explained by Mr. Hawkes; but as Mr. Chamberlain, not content to rest his case on its own merits, strives to heighten its effects by comparison with what he (if correctly reported) calls "the wretchedly bad bargain Mr. Cross is making," with your permission I will endeavour to put this comparison on a fair footing.

It is a well-known fact that the market price of the shares of the Birmingham Water-Works Company had nothing whatever to do with the price paid for the property. That price was based entirely on two considerations—(1) the capacity of the property for earning profit, and (2) the power of the shareholder to put that profit in his own pocket. The principle of the measure was, as, in fact (unless my memory is at fault), Mr. Chamberlain admitted recently in the House of Commons, identical with that of Mr. Cross's Bill—viz., the securing to the shareholder his present dividends, with compensation for future additions thereto. The sole question as between the two purchases is as to the application in each case of the principle common to them both. To introduce a comparison of market prices is to confuse the issue. The market price of a thing is affected in many ways, and it would not be difficult to show that any comparison between London and Birmingham in this respect is extremely fallacious. Let us look, therefore, at the two bargains from the same standpoint from which, until recently, we have been taught to look at one of them, and let us inquire what has been bought, and what has been given for it in each case.

In the case of Birmingham, a property was bought, which, by careful and good management, had been brought to almost the pinnacle of success. The ground had been covered, and the machinery, both of supply and distribution, was upon a scale which fully met the wants of the community. Further, the Company, by availing itself of its powers to raise its charges for water, had increased its revenues until it was in a position not only to pay the maximum dividends to which its Shareholders were by law entitled, but a commencement had been made towards paying back dividends for years wherein less than the maximum had been paid. In the last year of its independent existence the Company paid to its Shareholders in dividends the sum of £50,402. The price paid for the property was a perpetual annuity of £54,440.

Now let us look at Mr. Cross's bargain. He is proposing to buy the property of eight Companies. I am not on such familiar ground in dealing with these Companies, but I think I am correct in saying that of the eight, six are paying dividends which fall short of the maximum to which they are entitled by law. Two are apparently paying maximum dividends, and one of them seems to be paying something in the way of back dividends. Mr. Cross has ascertained that the present dividend-earning power of the eight Companies is £770,000 per annum, that this earning power is rapidly increasing, and that (at least) two Companies with largely-increasing incomes are entitled to £16,000,000 of "back dividends." The price which it is proposed to pay for these properties is an annuity commencing at £770,000, and gradually increasing until, in twelve years time, it will reach nearly £1,100,000. The present annual value of this annuity is calculated at slightly over £1,000,000.

Comparing the figures so far ascertained, we have:—

	Birmingham.		London.
Annual dividend-earning power	£50,402	..	£770,000
Annuity given therefor	54,440	..	1,000,000

In other words, for every £100 of income Birmingham gave £108 of annuity, while London for an equal sum is to give £130.

If the case were complete here, no doubt there would be ground for saying that Mr. Cross's bargain was a bad one, but it is not. In a word, the London Companies, though making great progress, have not yet attained to their full growth. They have large reserves of rating power, and they have a capacity for absorbing profit, in dividends, far beyond that possessed by the Birmingham Company at the time it was purchased. This has to be taken into account, and if a comparison is to be made between the two purchases, which shall be of any value at all, an element in the case of so much importance must not be overlooked. How to allow for it is, perhaps, a difficulty, but an attempt must be made. We must either estimate the value of the superior dividend-paying power of the London Companies, and add it to their present power, or we must deduct something from the Birmingham Company's dividend, so as to place the Companies on an equality. The latter process is the easier, because we have facts to go upon. Three of the London Companies are earning only 6½, their maximum being, I believe, 10 per cent.; two others earn 7½ per cent.; and a sixth 9 per cent. The Birmingham Company's maximum was 8 per cent. If we take a year in the Birmingham Company's history when it was paying 6½ per cent., we shall probably be under-estimating the future of the London Companies. In other words, the difference between the Birmingham Company in 1872, when it was earning 6½ per cent., and in 1875, when it earned 8 per cent., was probably less marked than that between the London Companies now and what they will become a few years hence if they have time given them to do as the Birmingham Company did. In 1872, then, the Birmingham Company paid in dividends £35,346, against the £50,402 of three years later. If we repeat our table we shall find it stand thus:—

	Birmingham.		London.
Annual dividend-earning power at a corresponding period in each case	£35,346	..	£770,000
Annuity given therefor . . .	54,440	..	1,000,000

In other words, for every £100 of income Birmingham gave £155, while London for an equal sum is to give £130.

In my opinion the comparison, fairly made, as I have endeavoured to make it, shows the wisdom of trying to buy the London Companies at the present time before they have obtained their full strength, as the Birmingham Company was enabled to do in the last few years of its existence, and I do not think either the Government or their supporters have any reason to be ashamed of the "Metropolis Water-Works Purchase Bill."

THE LANCASHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

There has been extremely little doing in either the coal or iron trades during the past week, and for the last few days business has been practically suspended owing to the holidays, the Manchester Exchange having been closed from Thursday evening last until this (Tuesday) morning.

So far as there has been any opportunity of testing, the market prices have been weaker. All classes of round coal are to be bought from holders of stock at lower figures, although nominally quotations are about the same as last week, and may be given as under:—Best Wigan Arley, 8s. to 8s. 6d.; common Arley, 6s. to 7s.; Pemberton four-feet, 6s. to 6s. 6d.; and common round coal, 5s. to 5s. 6d. per ton at the pit. An upward tendency is maintained in engine fuel, owing to the lessened production of slack, which, at most of the collieries, will be advanced next month. There is now very little slack to be bought under 3s. 6d. per ton, and burgy, which is going more into consumption, owing to the scarcity of slack, is firm at from 4s. to 4s. 6d. per ton at the pit.

Iron in second hands continues to be offered at very low figures, and so much under makers quotations that producers, who are generally firm at their list rates, are securing very few orders. For Lancashire pig iron, delivered into the Manchester district, makers quotations remain at 70s. per ton, less 2½ per cent. for both foundry and forge qualities. Lancashire bar iron, for delivery into the Manchester district, is quoted by makers at about £8 10s. to £9 per ton, but there are plenty of sellers at as low as £8 per ton.

Most of the collieries and iron-works have been partially stopped during the week, for the holidays.

THE COAL AND GENERAL TRADES OF THE NORTH OF ENGLAND.

(FROM OUR OWN CORRESPONDENT.)

We are in Easter week, and also at the close of the first quarter of 1880. Last week was the dullest in business circles in the Cleveland iron district since September last year. The intelligence from America was very discouraging, but pretty much what might have been anticipated under the circumstances. In view of the extraordinary rise in iron, permanent railway work has been stopped. Instead of 14,000 miles of permanent way being laid down in the Western States, as anticipated, there will not be more than 5000. Hopes of a large American trade this year are, therefore, dashed. The same observation will apply to Continental business. This changed position of affairs in the iron district is reacting pretty strongly upon the coal trade. It reduces it almost to a certainty that prices will not get beyond the March quotations.

The shipments of coals coastwise have been to a large extent gas; gas coals are also being exported, more than in any other part of March, oversea. Two or three large contracts in gas coals have been concluded for the year at old rates. The principal demand for shipment is, as a matter of course, for best qualities. A pretty good trade is also doing for second-class sorts for the immediate locality; but inferior coals have a very poor place in the market. Seaborne house coals continue to be subjected to a very keen competition from the inland collieries—that is, for coasting. The house coal trade of Durham and Northumberland is extremely slack. A reduction of something like 9d. per ton has occurred. Coke also has fallen about 2s. per ton from the extreme advances. So long as the iron-works are fully employed, working off the orders booked in January and February, the demand for small coals will be maintained; but there is no disposition shown to go into long contracts.

Shipping business improved a little last week. More was doing amongst steamers; but in the coasting market freights still favour shippers. As I have stated before, they will continue to do so over the first half of the year.

It cannot be said that there is any improvement in chemicals. The markets at Newcastle and Liverpool are dull and inelastic. Soda is the only article that fully maintains its price. The lead market is quiet. It is void of every element of speculation. The demand for chemicals and fire-clay goods is well maintained. The cement trade is dull.

FATAL ACCIDENT AT THE CHESTERFIELD GAS-WORKS.—On Saturday evening, the 20th inst., two men employed in the making of sulphate of ammonia at the Chesterfield Gas-Works were suffocated through neglect of one of them to carry out the instructions that had been given as to the process employed. At the inquest on the following Monday, some very interesting evidence was given before the Coroner, a report of which we reserve till next week.

ASSOCIATION OF MUNICIPAL AND SANITARY ENGINEERS AND SURVEYORS.—On Friday, the 19th inst., a district meeting of this Association was held at Dewsbury. The proceedings were commenced by the Secretary, Mr. Graham Smith, C.E., reading a paper by Mr. E. H. Allier "On the Sewage Disposal of West Derby, near Liverpool." In the paper were given statistics showing that the proceeds from a sewage farm, when properly managed, may be made to cover its working expenses. Mr. B. C. Cross, the Borough Engineer of Dewsbury, afterwards read a paper dealing with the sewerage scheme now being carried out by that borough. This paper went fully into the subject of the design and construction of the various sewers and works, and other matters relative thereto, such as the population and death-rate of the district. The members of the Association then thoroughly inspected the works, and were generally satisfied with them and the various novelties which have been introduced into their design by Mr. Cross.

Register of Patents.

APPLICATIONS FOR LETTERS PATENT.

1202.—STEVENSON, G. E., Peterborough, Northampton, "Improvements in apparatus used in the manufacture of gas." March 20, 1880.

1220.—PIEPER, C., Berlin, "Improvements in and relating to gas-generators and in gas-burning furnaces connected with them." A communication. March 22, 1880.

1221.—WEST, J., Maidstone, Kent, "Improvements in apparatus for breaking coal, and for charging and discharging gas-retorts." March 22, 1880.

1238.—THOMPSON, W. P., Liverpool, "Improvements in gas-heating apparatus, or apparatus in which gas is burned on the Bunsen principle." A communication. March 23, 1880.

1253.—MORLEY, C. W., Regent's Park, London, "An improvement in galleries or globe holders." March 24, 1880.

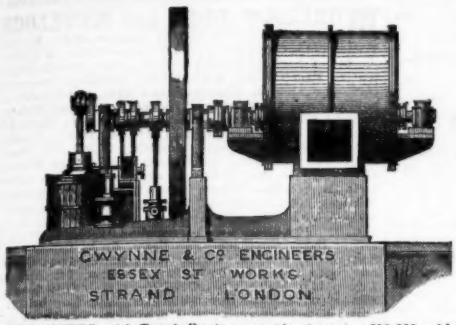
PATENTS WHICH HAVE PASSED THE GREAT SEAL.

3904.—WOOLLEY, W. B., Birmingham, "Improvements in hydrocarbon stoves and lamps for lighting and heating." Sept. 29, 1879.

4798.—KIRKHAM, T. N., and HERSEY, T., Westminster, "Improvements in apparatus employed in the manufacture of gas." Nov. 25, 1879.

The GRAND MEDAL of MERIT at the VIENNA EXHIBITION, TWO MEDALS at the PHILADELPHIA EXHIBITION and TWO MEDALS at the PARIS EXHIBITION, have been AWARDED to GWYNNE & CO. for GAS-EXHAUSTERS, ENGINES, and PUMPS; Also 27 OTHER MEDALS AWARDED at all the GREAT INTERNATIONAL EXHIBITIONS.

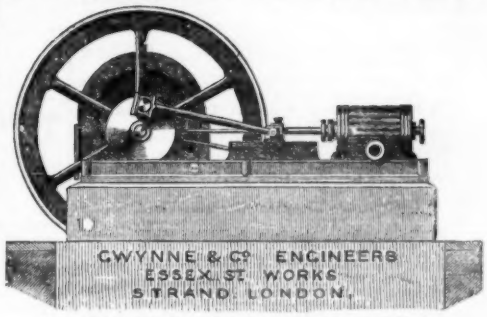
GWYNNE & BEALE'S PATENT GAS-EXHAUSTERS & ENGINES.



EXHAUSTER with Trunk Engine, capable of passing 210,000 cubic feet per hour.

The Judges report on the combined Exhauster and Steam-Engine exhibited at the Philadelphia Exhibition is—"*Reliable compact Machine, well adapted for the purpose intended, of excellent workmanship.*"

GWYNNE & CO. have made the largest and most perfect Gas-Exhausting Machinery in the world, and have completed Exhausters to the extent of 8,000,000 cubic feet passed per hour, of all sizes from 2000 to 210,000 cubic feet per hour.



52,500 EXHAUSTER, with Horizontal Engine combined.

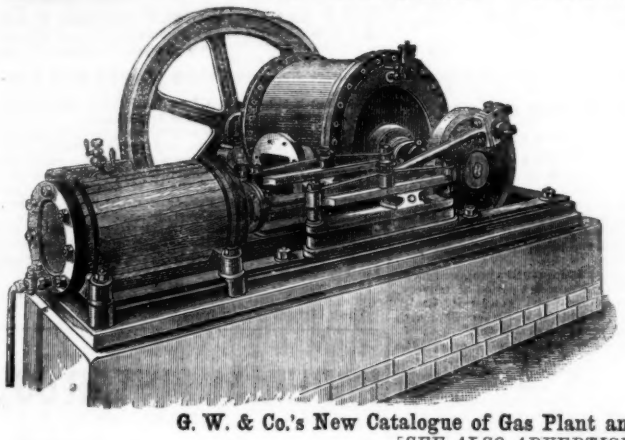
GWYNNE & CO. do not pretend to enter into a struggle with other makers in respect to cheapness. They have never sought to make price the chief consideration, *but to produce machinery of the very highest quality, and most approved design and workmanship.* The result is that in every instance their work is giving the fullest satisfaction. Numerous testimonials and references can be given to Companies using their Machinery for years past.

Exhausters, with or without Engines combined, can be made to pass the gas WITHOUT OSCILLATION OR VARIATION IN PRESSURE Regulators, Bye-Passes, Stop-Valves, Gas-Valves, Station Governors, and Gas Machinery of all Sizes.

PLEASE ADDRESS IN FULL, GWYNNE & CO., Hydraulic and Gas Engineers,
ESSEX STREET WORKS, VICTORIA EMBANKMENT, LONDON, W.C., ENGLAND.

Gwynne & Co.'s New Catalogue on Gas-Exhausting and other Machinery may be obtained on application at the above Address.

BEALE'S IMPROVED PATENT GAS EXHAUSTERS,



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SOLE MAKERS,

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MAKERS OF ENGINES, EXHAUSTERS,
INDEX AND DISC GAS-VALVES,
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TAR, LIQUOR, AND OTHER PUMPS,
SCRUBBERS AND PURIFIERS,
CONDENSERS, BOILERS, &c.

G. W. & Co.'s New Catalogue of Gas Plant and Machinery can be had on application.

[*SEE ALSO ADVERTISEMENT, PAGE* 498.]

Phœnix Engineering Works:

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WANTED, Readers of the NEW Edition, "Cooking & Heating by Gas;" on Burners, &c. Copies, by post, Threepence, direct from the Author, MAGNUS OHREN, Assoc.M.I.C.E., Gas-Works, SYDENHAM.

WANTED, by a Young Man, a Situation as GAS-FITTER, Main and Service Layer, and General Smith.

Apply, by letter, to No. 643, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a Situation as Working MANAGER or FOREMAN of a Gas-Works. Thoroughly understands the Manufacture and Distribution of Gas, and Main and Service Laying Meter Fixing, and Index Taking, &c., and Fitting in all departments.

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A Practical Analytical Chemist seeks an Engagement as CHEMIST in Gas-Works. Has knowledge of the same and of the methods for testing the Gas and Bye-products. The Advertiser has made some original and successful experiments for the Purification of Coal Gas and the conversion of the waste Sulpho-cyanogen Liquors into marketable products. Highest references.

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GAS SHARES to be Sold in the Uxbridge and Hillingdon Gas Company. Between 40 and 50 fully paid-up shares, for some years paying maximum dividends.

For particulars apply by letter to Mr. C. HORSLEY, 22, Wharf Road, CITY ROAD, N.

TO be Disposed of, at the Gas-Works, Landport, or delivered at any Port or Station, about 150 Tons (2240 lbs.) of CAST IRON, at per Ton.

Tenders to be delivered on or before the 21st of April next.

S. B. DARWIN, Secretary.

THE Directors of the Halesowen Gas Company, Limited, require the Services of a Young Man to act as SECRETARY, Manager, and Collector, and to act in all these under the instructions of the Directors. He must be a good Book-keeper, and also have a general Knowledge of the Routine of a Gas-Works. Salary £85.

Application, with references, to be sent to the CHAIRMAN, on or before the 7th of April.

BOROUGH OF BRADFORD.

THE Gas Committee of the Bradford Corporation require the services of a competent Person to act as SUPERINTENDENT of the Gas-Works at the Valley Road Station, at a salary of £150 per annum; and the services of another such Person to act as SUPERINTENDENT at the Thornton Road Station, at a salary of £100 per annum.

Any further information required may be obtained from Mr. Swallow, Gas Engineer, at his Offices at Mill Street, Bradford. It is indispensably necessary that applicants must be skilled in the Manufacture of Gas, and must be acquainted with mechanical work.

Application, endorsed "Superintendent of Gas-Works," accompanied by testimonials, to be sent to me on or before the 3rd of April next.

By order,
W. T. M'GOWEN, Town Clerk.

Town Hall, Bradford, March 15, 1880.

THE Sunbury-on-Thames Gas Company have FOR SALE the following PLANT, in good condition, thrown out to give place to larger:—

Two Purifiers, 5 ft. by 3 ft. by 3 ft. deep.

Six-inch Connections with Lifting Screw and Traveller complete.

Three 6-in. Cathels's patent Four-way Valves.

Station-Meter to pass 1500 feet per hour, 4-in. Connections.

Five-inch Condenser, nine Pipes, and Tar Box with Overflow Pipe.

Six 6-in. Donkin's Valves.

For particulars and price apply to Mr. JOHN SMITH, Manager, Gas-Works, Sunbury-on-Thames. MIDDLESEX.

SLEAFORD GAS COMPANY, LIMITED.

FOR SALE—Single Gasholder, 32 ft. by 14 ft., Counter-balanced, Connections and all complete, in good condition. Reason for removal, ground wanted.

Particulars to be had of HARRY WIMHURST, Manager.

THE Gloucester Gas Company, ceasing to manufacture gas at their old works, will have the undermentioned APPARATUS for Sale about the beginning of August, viz.:—

About 150 feet of D-shape Wrought-Iron Hydraulic Main, size 19 in. by 19 in. Also about 38 ft. of D-shaped Wrought-Iron Hydraulic Main size 20 in. by 20 in. Annular Condenser, consisting of six Vertical Pipes, 24 in. diameter, 19 ft. high, with three 12-in. Slide-Valves and 12-in. Connections.

Scrubber (round), 5 ft. by 20 ft., with three 12-in. Slide-Valves, and 12-in. Connections.

Exhauster (Jones) to pass about 15,000 feet per hour.

Exhauster (Beales) to pass about 25,000 feet per hour.

Two Vertical Steam-Engines, each about 6-horse power, with Pulleys, and Shafting used for driving the above.

Boiler 14 ft. 6 in. by 3 ft. 6 in., with Centre Tube, and four Galloway Patent Tubes.

4-horse power Horizontal Steam-Engine.

Three 4-in. Pumps, with cranked Shafting and a pair of Mitre Wheels.

Two Purifiers, 16 ft. by 8 ft., with six 12-in. Slide-Valves and 12-in. Connections.

Station-Meter by A. Wright and Co., London, with three 12-in. Slide-Valves, and 12 in. Bye-Pass and Connections, to pass about 25,000 feet per hour.

Gasholder, Double Lift, with Cast-Iron Tank, capacity 37,000 feet.

Gasholder, Double Lift, capacity 100,000 feet.

Gasholder, Double Lift, capacity 240,000 feet.

One 12-in. Governor, by Wright, London, with 12-in. Valves, Bye-Pass, and Connections.

Two 12-in. four-way faced Valves, by Cockey.

For further information, &c., apply to the undersigned.

R. MORLAND, Engineer.

ON SALE, at the Manchester Corporation Gas-Works, a STATION-METER made by Crossley, of London, and capable of passing about 30,000 cubic feet per hour.

Further particulars upon application to Mr. GEORGE B. JACKSON, Town Hall, MANCHESTER.

THE Sheffield United Gaslight Company OFFER for SALE the following lots of Retort-House FITTINGS, which they are now taking down at two of their Stations:—

51 Pieces Cast-Iron Hydraulic Main, U-shaped, 9 ft. 6 in. by 18 in. by 18 in.
16 Pieces Cast-Iron Hydraulic Main, U-shaped, 9 ft. 6 in. by 18 in. by 15 in.
4 Pieces Cast-Iron Hydraulic Main, U-shaped, 9 ft. 6 in. by 16 in. by 15 in.
320 Cast-Iron Mouthpieces, D-shaped, 21 in. by 15 in.
160 Lengths 4-in. Cast-Iron Ascension-Pipes, straight, 7 ft. 6 in. long.
215 Lengths 4-in. Cast-Iron Ascension-Pipes, straight, 5 ft. 6 in. long.
50 Lengths 4-in. Cast-Iron Ascension-Pipes, curved, 5 ft. 6 in. long.
60 Lengths 4-in. Cast-Iron Ascension-Pipes, curved, 2 ft. 8 in.
37 Lengths 4-in. Cast-Iron Ascension-Pipes, curved, 10 ft. 2 in.
40 Lengths 4-in. Cast-Iron Ascension-Pipes, straight, 5 ft. 10 in.
17 Lengths 4-in. Cast-Iron Ascension-Pipes, straight, 5 ft. 5 in.
481 Lengths 4-in. Cast-Iron H-Pipes.
506 Lengths 4-in. Cast-Iron Dip-Pipes.

The above apparatus has been in use up to a recent date, and is adapted for re-erection.

The Company will be prepared to receive an offer for the whole or any portion of the above. Price £4 per ton, loaded into trucks at Sheffield.

Applications to be addressed to the undersigned.

THOS. ROBERTS, Manager.

Gas Office, Sheffield, March 25, 1880.

AMMONIACAL LIQUOR.

THE Best Continuous Method for Working Large or Small Quantities of Liquor. This is an improvement on what is known as the "Coffey Still Process." The result in sulphate of ammonia is very large, nearly every atom of ammonia gas being driven out of the liquor before it is liberated, also a saving in acid. Small Working Models to work about 5 gallons per day, with steam boiler and every requisite, sent c.o.d., carriage paid, price £4 4s. Also improved (and, if required, continuous) method of Working Liquor Ammonia from Gas Liquor.

Address JOHN G. HARVEY, Milnsbridge, HUDDERSFIELD.

TO LIME BURNERS, MERCHANTS, &c.

THE Directors of the Barnsley Gas Company are desirous of receiving TENDERS for the Supply of the whole of the LIME required at their New and Old Works, at Barnsley, for purifying purposes, for One or Three years, commencing July 1, 1880, the same to be delivered into the lime sheds at both works respectively.

Any further particulars may be had on application to the undersigned.

Tenders, addressed to the Chairman, to be sent to me not later than Thursday, the 1st of April next.

JOHN HUTCHINSON, Manager.

Gas Office, March 17, 1880.

TO MANUFACTURING CHEMISTS, TAR DISTILLERS, &c.

THE Directors of the Barnsley Gas Company are desirous of receiving TENDERS for the Purchase of the Surplus COAL TAR produced at the Works at Barnsley and Old Mill, for a term of One or Three years, commencing from the 1st of July next.

Probable quantity and any other particular on application to the undersigned.

Tenders, addressed to the Chairman, to be sent to me not later than Thursday, the 1st of April next.

JOHN HUTCHINSON, Manager.

Gas Office, March 17, 1880.

BOROUGH OF SOUTHPORT.

THE Gas Committee of this Corporation invite TENDERS for the Supply and Erection complete, at their Crowlands Gas-Works, of Two PURIFIERS, each 20 ft. square by 5 ft. deep. Also Centre-Valve and Lifting Apparatus.

Plans and specification may be seen at my Office, Eastbank Street, Southport.

Tenders, endorsed "Purifiers," addressed to Keighley Walton, Esq., Town Clerk, Southport, must be sent in not later than Wednesday, the 31st of March inst.

By order,

JNO. BOOTH, Manager.

Southport, March 12, 1880.

DORKING GAS COMPANY.

THE Directors of the Dorking Gas Company invite TENDERS for the Supply of

2200 Yards of 4-in. Cast-Iron PIPES, Coated or not Coated.
100 " 6 " " " "
400 " 10 " " " "

To be delivered by the end of April, free at the South-Eastern Station, Dorking.

Tenders, to be endorsed "Tender for Pipes," to be sent to me on or before the 12th of April next.

The Directors do not bind themselves to accept the lowest or any tender.

WALTER PHILPS, Secretary and Manager.

Gas Office, Station Road, Dorking, March 24, 1880.

WALTHAM ABBEY AND CHESHUNT GAS COMPANY.

TO GASHOLDER MAKERS.

THE Directors of the above Company require TENDERS for the erection of a TELESCOPE GASHOLDER to contain 130,000 cubic feet.

Drawings and specification may be seen upon application to Mr. Corbet Woodall, the Gas-Works, Vauxhall Bridge, S.E.

Tenders, addressed to the Chairman, Gas-Works, Waltham Cross, are to be delivered before noon on Friday, April 9.

The Directors do not bind themselves to accept the lowest or any tender.

HUBERT GOUGH, Secretary.

RIO DE JANEIRO GAS COMPANY, LIMITED.

THE Shareholders are hereby informed that the FIFTEENTH ANNUAL GENERAL MEETING of this Company will be held at the Cannon Street Hotel, Cannon Street, London, E.C., on WEDNESDAY, the 7th day of April next, at Twelve o'clock at noon precisely, to receive and confirm the Directors Report and Balance Sheet for the year ending the 31st of December last, and to declare a Dividend; also that the Transfer Books are closed from to-day's date to the 7th prox., both days inclusive.

By order,

THOMAS DAWSON, Secretary.

No. 1, Gresham House, Old Broad Street, London, E.C., March 24, 1880.

TOTTENHAM AND EDMONTON GAS-LIGHT and COKE COMPANY.

NOTICE is hereby given that the HALF-YEARLY ORDINARY GENERAL MEETING of PROPRIETORS in this Company will be held at the Works, Willoughby Lane, Tottenham, on SATURDAY, the 10th of April next, at Three o'clock in the afternoon precisely, to receive the Report of the Directors, the Statement of Accounts for the Half Year ended the 31st of December, 1879, to declare Dividends, and for transacting such other business as the Act of Parliament directs.

The Transfer Books will be closed on Thursday, the 25th inst., until after the Meeting.

The Dividends to be declared will be payable on and after Monday, the 12th April next.

By order,

JAMES RANDALL, Secretary.

Offices, Edmonton, Middlesex, March 25, 1880.

TENDERS FOR TAR AND AMMONIACAL LIQUOR.

THE Gas Committee of the Dewsbury Corporation are prepared to receive TENDERS for One, Two, or Three years (as may be agreed upon), commencing on the 1st of July next, for the Purchase of the Surplus TAR and AMMONIACAL LIQUOR produced at their New Gas-Works, Savile Town, which are situated close to the Canal. Quantity of coals carbonized, about 13,000 tons per annum. The tenders for Tar to state price per ton and the tenders for Ammoniacal Liquor to state price per unit per cent. of Ammonium Sulphate per ton of liquor.

Any further information may be had on application to the undersigned.

Sealed tenders, endorsed, to be sent to Jesse Smith, Esq., Town Clerk, on or before the 14th of April next.

The Committee do not bind themselves to accept the highest or any tender.

CHAS. ARMITAGE, Engineer and Manager.

MANCHESTER CORPORATION GAS-WORKS.

TO COLLIERY PROPRIETORS AND OTHERS.

THE Gas Committee will receive, not later than Tuesday, the 20th of April next, TENDERS of CANNEL and COAL for delivery at their Works, situated at Gaythorn and Rochdale Road, during a period commencing from the 1st of July next (tenders for three or five years will have the preference), and the Committee are now prepared to receive applications for permission to send in samples.

Sealed tenders, stating price and quantity proposed to be delivered at each station and the rate and period of delivery, and endorsed "Tender for Cannel" or "Tender for Coal," as the case may be, must be addressed to the Chairman of the Gas Committee, and delivered at this Office.

The Committee do not bind themselves to accept the lowest or any tender.

By order,

JOSEPH HERON, Town Clerk.

Gas Department, Town Hall, March 25, 1880.

SECOND-HAND ENGINES, EXHAUSTERS, BOILERS, &c.

THE Scarborough Gas Company invite OFFERS for the Purchase of their present Duplicate Exhausting Machinery, comprising Two 7-in. Cylinder by 14-in. Stroke Horizontal Steam-Engines; Two 20,000 cubic feet per hour Gwynne and Beale's Patent Exhausters; Two Hydraulic Governors in Connection with Throttle Valves of Engines; and Two Cornish Boilers, 11 ft. by 3 ft. 9 in.

The whole are of superior make and have been carefully used, and are well worth attention, being about to be removed for replacement by larger and more powerful apparatus.

The machinery may be seen in operation until the 30th of April, and further particulars may be obtained on application to the undersigned.

By order,

WILLIAM J. MOON, Manager.

Scarborough, March 5, 1880.

ILKESTON LOCAL BOARD—GAS DEPARTMENT.

CONTRACT No. 1.

THE Gas and Water Works Committee of this Local Board are prepared to receive TENDERS for the Erection at their Gas-Works, at Ilkeston, of a RETORT-HOUSE and Chimney Shaft, Retort Bench, Coal Store, Mess Room, Urinals, Closet, Engine and Exhauster House, Meter-House, with certain alterations to present Retort-House, and other Works.

Plans and specifications may be seen, and forms of tender and further information obtained, on application to the Manager.

Tenders, properly endorsed, must be sent to me on or before Friday, the 2nd of April next.

The Committee do not bind themselves to accept the lowest or any tender.

By order,

WRIGHT LISSETT, Clerk to the Board.

Town Hall, Ilkeston, March 13, 1880.

NOTICE TO MANAGERS OF GAS COMPANIES.

THE LAW UNION FIRE AND LIFE INSURANCE COMPANY, of No. 126, Chancery Lane, London, grants Policies of Insurance on Gas-Works, and Buildings connected therewith, which cover risk of explosion and spontaneous ignition of Coal, on very advantageous terms. Full particulars will be sent post free on application to

FRANK M'GEDY, Secretary.

126, Chancery Lane, London.

PARTICK STATION, GLASGOW CORPORATION GAS-WORKS.

EXTENSIVE PUBLIC SALE OF THE WHOLE MATERIAL OF THE PARTICK GAS-WORKS.

(Belonging to the Glasgow Corporation Gas Commissioners, who have now transferred the manufacture of gas for that district to their extensive new works at Dawsholm.)

MORRISON, DICK, and M'CULLOCH are instructed to Sell by Auction, at the Partick Station of the Glasgow Corporation Gas-Works, on Friday, the 2nd of April, at Twelve o'clock exact, the whole extensive PLANT and MATERIAL, including Telescope Gasholder, 100 ft. diameter, rises 40 ft., and capable of holding 350,000 feet, made by Hanna, Donald, and Wilson, in good condition, and almost equal to new; Single-lift Gasholder, 80 ft. diameter, rises 19 ft., by Hanna, Donald, and Wilson, and capable of holding 90,000 feet; Small Single-lift Gasholder, by Hanna, Donald, and Wilson, 40 ft. diameter, rises 20 ft., and capable of holding 26,000 feet; Beam High-Pressure Steam-Engine, by M'Onie and Mirrlees, 14-in. Cylinder, 3-ft. Stroke; Jones's Exhauster, with 18-inch Connections; Large Station-Meter, 9 ft. by 9 ft., by S. Crossley, London, registers 10,000,000, in good order; 18-in. Governor, with Beam, by R. Laidlaw and Sons, nearly new, with Connections; another 18-in. Governor, with Float, by Parkinson; Scrubber, 7 ft. 6 in. by 7 ft. by 16 ft. high; 2 Box Condensers, each 61 ft. long by 13 ft. high; another Box Condenser, 74 ft. long by 13 ft. high; 4 Purifiers, each 18 ft. 6 in. by 11 ft., with Valves and Connections; 4 Purifiers, each 8 ft. 6 in. by 8 ft., with Valves and Connections; 8 Purifiers, each 8 ft. 6 in. by 5 ft. 6 in. and Centre Valve; about 200 ft. Hydraulic Mains, 18 by 18, supported on 22 Cast-iron Pillars; about 200 ft. Hydraulic Mains, 14 by 14, supported on Wall Brackets; Malleable and Cast-Iron Metal Work of 120 Retorts; extensive ranges of 18 and 15 in. Cast-Iron Pipes, outside and underground, through whole Works, Building Materials, &c.

The whole will be on view on Thursday, the 1st of April, from 9 a.m. to 6 p.m.; or Mr. GRANGER, Manager, will allow inspection any time prior on an admission order, to be had from the Auctioneers.

Details in Catalogue, to be had at our Office, 98, Sauchiehall Street, Glasgow; or forwarded, post free, on request.

RAMSGATE IMPROVEMENT COMMISSIONERS WATER SUPPLY.

THE Gas and Water Committee of the Ramsgate Improvement Commissioners are prepared to receive TENDERS from competent persons for the following WORKS:—

Contract No. 1.—A Building to carry a raised Water-Tank.

Contract No. 2.—A Cast-Iron Water-Tank and Girders, together with certain Pipes and Appendages.

On and after Saturday, the 27th inst., the drawings and specifications may be seen, and forms of tender, with quantities, may be obtained on payment of one guinea for each contract (which will be returned if a *bona fide* tender be sent in) at the Offices of Mr. G. W. Stevenson, 38, Parliament Street, Westminster, or of Mr. William A. Valon, the Gas-Works, Hardres Street, Ramsgate.

Sealed tenders, properly endorsed, and addressed to the Chairman of the Gas and Water Committee, to be delivered at the Gas-Works, Ramsgate, before 2 p.m. on Tuesday, April 6.

By order,

W. A. HUBBARD, Clerk.

Town Hall, Ramsgate, March 25, 1880.

THE

IMPERIAL METER CO.,

LIMITED,

Makers of THE IMPROVED DRY GAS-METERS, THE PATENT WET GAS-METERS, Special Meters for Public Lighting, STATION-METERS, Governors, &c.

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Specimen, with illustration and full particulars; 2s. 6d. returned on the purchase of a "Journal."

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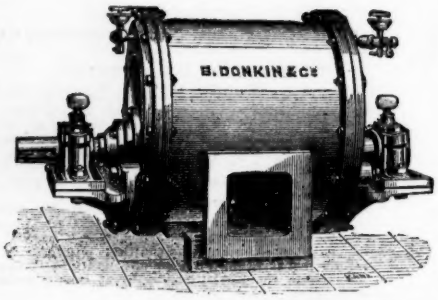

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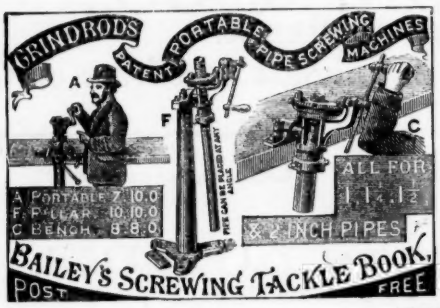

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No.	Diameter of Steam Cylinder.	Diameter of Pump.	Length of Stroke.	Gallons pr. Hour. Approx.	Price
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C 3	6	4	10	2,000	30
D 4	8	4	10	3,150	40
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K 10	12	8	15	14,600	90
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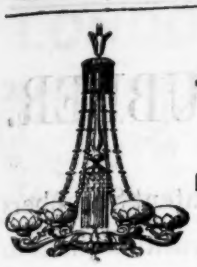

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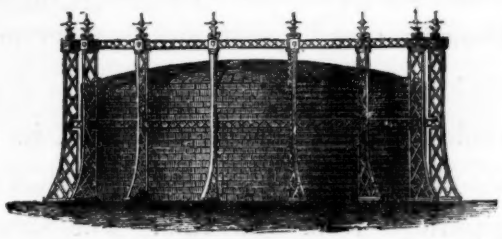

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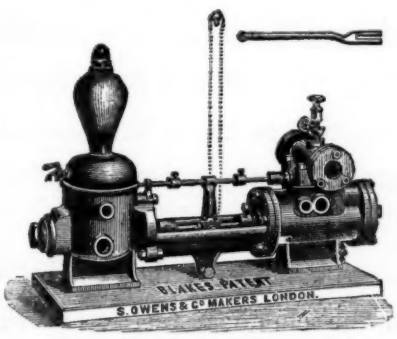

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AND

WENLOCK IRON WHARF, 21 & 22, WHARF ROAD, CITY ROAD, LONDON, N.,

Manufacture and keep in stock at their works (also a large stock in London) PIPES and CONNECTIONS 1½ to 48 inches in diameter; and make to order Retorts, Purifiers, and Tanks, with or without planed joints, Columns, Girders, Special Castings, required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.

NOTE.—Syphons and Covers are joint-faced if required, doing away with millboard and iron boring, or Syphons made without Covers, a socket being cast on and fitted with a small plug about 6 inches in diameter with lead joint. In either way preventing leakage.

MEMORANDUM FOR GAS COMPANIES.

TORBAY AND DART PAINT COMPANY, LIMITED,

SOLE PROPRIETORS AND MANUFACTURERS OF

WOLSTON'S

TORBAY PAINTS.

OFFICES:

23, GREAT GEORGE STREET, WESTMINSTER, LONDON, S.W.

WORKS:

DARTMOUTH AND BRIXHAM, DEVON.

TRADE MARK

These celebrated Paints are now very generally acknowledged to be the best and most economical in use. GAS COMPANIES especially have, by experience, proved that no others so fully meet their peculiar requirements, as they are not only UNAFFECTED BY GREAT HEAT and EFFECTUALLY RESIST SULPHURETTED HYDROGEN, AMMONIA, &c., &c., but they may be applied to GASHOLDERS that have hitherto been covered with the unsightly coal tar.

They are also cheaper than other paints and compositions; TWO COATS OF GENUINE WOLSTON'S TORBAY PAINT BEING EQUAL IN COVERING POWER TO THREE OF LEAD PAINT, or any of the numerous low-priced spurious oxides that are now in the market, whilst the durability of Wolston's is unrivalled.

The colours most approved for GASHOLDERS, PURIFIERS, SCRUBBERS, and all the plant and machinery used in and about Gas-Works, are—

FOR DARK TINTS.

No.	p. Cwt.	No.	p. Cwt.
13. Torbay Red	34s.	8. Bronze Green	36s.
6. Dart Brown	34s.	16. Torbay Chocolate	34s.
10. Carriage Red	34s.		
1. Torbay Brown	30s.	4. Brixham Black	32s.

FOR LIGHT TINTS.

No.	p. Cwt.	No.	p. Cwt.
7. Imperial Stone	34s.	19 Light Stone	36s.
29. Portland Stone	38s.	30. Bath Stone	38s.
31. Gray Stone	38s.	38. Buff	36s.

These Prices are for Paints in paste, carriage paid to any Gas-Works in Great Britain, in consignments of not less than 5 cwt.; but all the above colours may be had, READY MIXED FOR THE BRUSH, IN VARIOUS SIZED PAINT CANS WITH HANDLES, AT A UNIFORM PRICE OF 56s. PER CWT. (6d. PER LB.) carriage paid as above, in consignments of not less than 2 cwt., the sizes being 3 lb., 7 lb., 14 lb., and 28 lb. By taking the Paints in this convenient form, a considerable saving is effected in time, &c., as they can be immediately applied by any workman without the intervention of skilled painters to mix and prepare them; besides which all waste is avoided, and they may always be relied on as containing no adulterating or inferior material.

Where light colours are preferred, the work should be primed with two coats of No. 7, and finished with either of the other stone colours; and when the darker colours are selected, a priming coat of No. 13 is recommended.

Specimen Cards forwarded and Inquiries attended to on application to

23, GREAT GEORGE STREET, WESTMINSTER, LONDON.

THE
MANN & WALKERS' PATENT SCRUBBER.

Extensive use.

The successful and extensive use of the Mann and Walkers' Patent Scrubbers in all parts of the world has demonstrated their advantages, and entitled them to be received with credit and confidence. The number of them in use is about twenty times that of any other known means of purifying gas from ammonia.

Small quantity of Water required.

By a very small quantity of clean water (not more than 5 or 6 gallons per ton of coals carbonized) the whole of the Ammonia contained in the Gas is completely absorbed; the Gas, after only once passing through, issuing from the Scrubber outlet completely purified from Ammonia. The Scrubber gives no appreciable back pressure.

Residual Product obtained.

The Residual Product—namely, the Ammoniacal Liquor—is obtained at from 20 to 30 ounces commercial strength, which enables it, after being mixed with the weaker Liquor from the hydraulic main and condensers, to be sold to the Manufacturing Chemists, or converted into Sulphate, at the degree of strength found most profitable to the Gas Company.

Illuminating power increased.

The Scrubber is a Saturator, and the Gas being soaked in this strong solution of Ammonia in the lower columns of the Scrubber, is purified from a large amount of Carbonic Acid, and its Illuminating Power is thereby increased.

Small amount of power required.

The friction is so little, and the motion so slow, that the power necessary to work the Scrubber is almost inappreciable. A small gas-engine will work a pair of Scrubbers, purifying 2 million cubic feet of gas per day.

Beckton Gas-Works.

There are thirty of these Patent Scrubbers in the Beckton Gas-Works, equal to purifying 30 million cubic feet per day, and the total amount of engine power necessary to work the whole 30 is not equal to that given out by one 10-horse engine.

Reserve purifying power contained.

There is also a most important advantage arising from the height of these Scrubbers, in the reserve force contained in them. In the event of any stoppage, the mass of soaked and wetted material would continue the purification for hours, even if the supply of water and working were stopped from any cause.

Internal Materials not changed.

The changing of the soaking materials in these Scrubbers is very seldom required; they are well known to remain in action for seven years without being emptied.

Guarantee.

They are in all cases erected under guarantees; they easily fulfil the stipulations of any Act of Parliament, and the chemical restrictions of the Board of Trade; and in cost they are much less to a Gas Company than any other known means of purifying Gas from Ammonia.

C. & W. WALKER.

8, Finsbury Circus, London, E.C.

LONDONDERRY GAS COALS

DIRECT FROM THE

MARQUESS OF LONDONDERRY'S COLLIERIES.

COUNTY OF DURHAM.

For Prices and Particulars, apply to

MR. S. J. DITCHFIELD,

LONDONDERRY OFFICES, SEAHAM HARBOUR, COUNTY OF DURHAM.

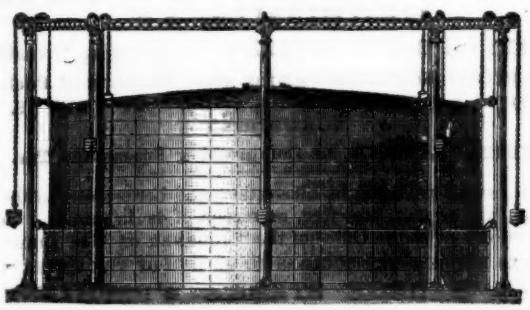
London Agents: Messrs. LAMBERT BROS., 65, GRACECHURCH ST., E.C.

JOHN HALL AND CO., STOURBRIDGE,

Manufacturers of FIRE-BRICKS, LUMPS, TILES,

AND EVERY DESCRIPTION OF FIRE-CLAY GOODS.

N.B.—A Stock of 15 and 16 in. CIRCULAR RETORTS always on hand. Other kinds made to order on short Notice.



J. T. B. PORTER & CO.,

GAS ENGINEERS & MANUFACTURERS,

IRONFOUNDERS AND CONTRACTORS,

GOWTS BRIDGE WORKS,

LINCOLN.

LONDON OFFICES: 1, WESTMINSTER CHAMBERS, S.W.

ESTIMATES FOR GAS-WORKS OF ANY SIZE.

REFERENCES TO 500 WORKS ALREADY ERECTED.

N.B.—All Communications to be addressed to the FIRM ONLY.

W. PARKINSON & CO.,

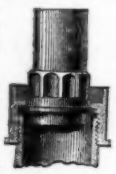
SOLE AGENTS FOR AND MANUFACTURERS OF

FOULGER'S PATENT SEAL UNIONS,

As Supplied to The Gaslight and Coke, Commercial, South Metropolitan, and other Companies.

These Unions practically place a Gas Company's property under lock and key, by rendering it impossible to disconnect at any joint at which gas can be obtained unregistered, without destroying the Company's Seal.

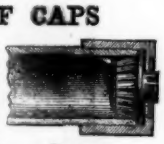
In fixing the Union (one being required on the main cock and another on the inlet only), some molten sealing-wax is poured into the recess on cap, and whilst hot impressed with Foulger's patent tong-shaped die, having the Gas Company's title engraved thereon; the wax being forced into the flutings on the lining, instant destruction of the Seal accompanies any attempt at disconnection.



SECTION.

FOULGER'S PATENT SEAL CUTTING-OFF CAPS

Cannot be taken off without destroying the Company's Seal. A tapered fluted plug (having been white-leaded or puttied) is inserted in the service-pipe. The cap (already filled with sealing-wax) is then screwed over, and tightens on a washer on the flange of plug. The wax is then warmed, and stamped with the engraved die. Absolute security against fraud and escape is thus obtained.



SECTION.

A great advantage will also be recognized in stopping the gas instantly with the plug, and consequent immunity from the present source of danger occasioned by escape during fitting the ordinary cap, frequently in a confined position, and often occupying a considerable time.

Small additional cost over existing connections.

COTTAGE LANE, CITY ROAD, LONDON, E.C.

T. NEWBIGGING,

CONSULTING GAS ENGINEER,

5, NORFOLK STREET, MANCHESTER.

HENRY LYON,

MECHANICAL AND CONSULTING GAS ENGINEER,

NORWOOD, NORTHENDEN ROAD,

SALE, NEAR MANCHESTER.

SANDELL AND SON,

PUBLIC ACCOUNTANTS,

2, GREAT GEORGE STREET, WESTMINSTER.

SANDELL AND SON having been engaged during the past 25 years in Gas Companies Accounts, either in Preparing or Investigating Statements for Parliamentary Applications, Arbitrations, and otherwise, offer with confidence their Services for similar purposes.

ALFRED LASS, F.I.Accts.,

SPECIAL ACCOUNTANT FOR GAS AND WATER UNDERTAKINGS,

30, GRACECHURCH STREET, LONDON.

Accounts Analysed and Statistics Prepared for Parliamentary Proceedings, Arbitrations, &c.

The Forms of Account, which have been specially designed by Mr. Lass to meet the requirements of the Gas-Works Clauses Amendment Act, 1871, are now in use by many Gas Companies, Corporations, and Local Boards.

JAMES NEWTON & SONS,

(Established 1820,)

FIRE-BRICK AND TILE MERCHANTS,

Wholesale and for Exportation,

FALCON DOCK, 78 AND 79, BANKSIDE,

SOUTHWARK, LONDON, S.E.,

DEPÔT for STOURBRIDGE AND NEWCASTLE FIRE-BRICKS, LUMPS, TILES, and FIRE-CLAY, and every Article suitable for

GAS AND WATER WORKS.

HARPER & MOORES,

PROPRIETORS OF THE

BEST STOURBRIDGE CLAYS,

STOURBRIDGE.

Manufacturers of all Descriptions of

BEST STOURBRIDGE FIRE-BRICKS, LUMPS, AND CLAY RETORTS

Of all Dimensions for Gas-Works,

GLASS-HOUSE POTS & CRUCIBLES

ESTABLISHED 1836.

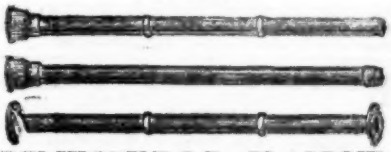
The Highest Award was obtained by H. & M., at the Philadelphia Exhibition, 1876, for Superior Quality of Manufacture. SILVER MEDAL, PARIS, 1878.

GAS AND WATER PIPES.

WILLIAM MACLEOD & CO.,

30, ST. ENOCH SQUARE, GLASGOW.

CAST-IRON GAS AND WATER PIPES.



DELIVERY F.O.B., GLASGOW.

Prices on application.

JOHN ROMANS, C.E., F.G.S.E.,

CONSULTING GAS ENGINEER

AND

CANNEL COAL FACTOR,

30, St. Andrew Square, EDINBURGH.

Plans and Estimates furnished; Gas-Works, Apparatus, Pipes, Machinery, Fire Goods, &c., supplied, or Attested and Shipped for Exportation.

GAS-WORKS TAKEN ON LEASE.

Mr. ROMANS has for upwards of 30 years been practically engaged in the Manufacture of Gas, and has, by extensive experiments, ascertained that by JUDICIOUS INTERMIXTURE of the lighter with the heavier gases, much of the rich Hydrocarbons CAN BE SAVED, which otherwise ARE LOST, during the process of manufacture. He is therefore enabled to give advice to those who favour him with their orders for Cannel, as to the class which will secure for their standard of illuminating power the HIGHEST ADVANTAGEOUS RESULTS.

ANALYSES AND PRICES FORWARDED ON APPLICATION.

ROBERT MARSHALL,

CANNEL COAL MERCHANT,

198, ST. VINCENT STREET, GLASGOW.

SHOTT'S BOGHEAD.

HARTHILL CANNEL

Yields 14,920 cubic feet of 40·92-candle gas per ton.

THRASHBUSH CANNEL

12,530 cubic feet of 40·22-candle gas per ton, and 9 cwts. of good coke.

LOTHIAN'S CANNEL

Yields 13,600 cubic feet of 34-candle gas per ton, and 9 cwts. of excellent coke, containing only 4 per cent. of ash.

MUIRKIRK, No. 1, CANNEL

Yields 12,160 cubic feet of 32·5-candle gas per ton, and 10 cwts. of excellent coke, containing only 5 per cent. of ash. This cannel is almost free from sulphur.

OLD WEMYSS CANNEL

Yields 13,320 cubic feet of 32·5-candle gas per ton.

Prices and full analyses on application at above address, or from WEDDERSPOON, FERGUSSON AND CO., 21, Lime Street, LONDON, E.C.

HEBBURN MAIN GAS COAL.

This Coal is now highly approved of for gas making, and yields over 10,000 feet per ton of 15-candle gas, and about 14 cwt. coke.

For references and prices, either f. o. b. or by rail, apply to

W. RICHARDSON,

29, QUAYSIDE, NEWCASTLE-ON-TYNE.

GAS COAL.

POPE & PEARSON, LIMITED, have now the authority of several of the most eminent Gas Engineers of London in stating that their Coal yields *in practical working over* 10,000 *cubic feet of gas, with an illuminating power of* 16 *candles;* or by the standard burners now used by the London Gas Companies, an illuminating power equal to 17½ candles.

One ton yields 12½ cwt. of good coke. This Coal can be shipped from Hull, Goole, Liverpool, Morecambe, and Barrow.

For further particulars, apply to POPE AND PEARSON, LIMITED, West Riding and Silkstone Collieries, near LEEDS.

GAS COAL.

THE Tawd Vale Colliery Company, Limited, are prepared to Contract for the Supply of their superior Arley and other GAS COALS, and to send samples to the order of Gas Engineers and others, or complete Analysis, on application. Shipped at Liverpool, Preston, Fleetwood, Garston, or Birkenhead.

Mr. James Paterson, C.E., F.G.S., in his analysis of T. V. Arley Coal, says: "Some parts merge into a semi-Cannel; gas per ton, 10,300 cubic feet; illuminating power, 16·96 candles; coke of high quality, 1431 lbs. per ton."

Collieries, Skelmersdale, near Ormskirk; Offices, 5, New Hall, Old Hall Street, LIVERPOOL.

THE

SILICA FIRE-BRICK CO.,

OUGHTIBRIDGE

Near SHEFFIELD,

Manufacturers of THE ORIGINAL SILICA OR DINAS FIRE-BRICKS. Specially adapted for Gas-Retort Furnaces and for Siemens's Gas-Furnaces. Shipments promptly executed to London, Liverpool, Hull, Grimsby, &c.

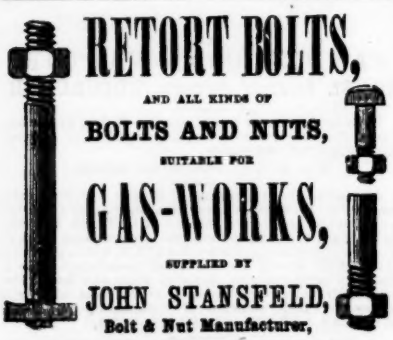
BIRTLEY IRON WORKS,

CHESTER-LE-STREET, DURHAM.

Manufactory for every description of Casting and Machinery for Gas-Works and Water-Works.

Warehouse in London for Cast-Iron Pipes and Connexions of all sizes and in any quantity, Scott's Wharf, Bankside, Southwark.

Agent in London, Mr. J. MANWARING, 101 Cannon Street, E.C.



RETORT BOLTS,

AND ALL KINDS OF

BOLTS AND NUTS,

SUITABLE FOR

GAS-WORKS,

SUPPLIED BY

JOHN STANSFELD,

Bolt & Nut Manufacturer,

ALFRED ST., BOAR LANE, LEEDS.

FERRAND DAVIES,

148, GRESHAM HOUSE, OLD BROAD STREET, LONDON, E.C.,

AGENT FOR

THOMAS BARR'S LESMAHAGOW MAIN CANNEL,

AND

NEWTON, CHAMBERS, & CO.'S SILKSTONE GAS COALS.

Analyses and Quotations on application.

WILSON CARTER AND PEARSON,

GAS COAL AND CANNEL FACTORS,

Supply to any Railway Station or for Export all kinds of Fuel for Gas purposes.

Address—CHIEF OFFICES:

TEMPLE BUILDINGS, 50, NEW STREET, BIRMINGHAM.

GEORGE ANDERSON,

GAS AND CONSULTING ENGINEER,

35A, GREAT GEORGE STREET,

WESTMINSTER, S.W.,

PATENTEE and MANUFACTURER of the following Inventions:—

RETORT SETTINGS—giving great Economy of Fuel.

STEAM-ENGINES and EXHAUSTERS, FOUR-WAY VALVES, WASHERS, SCRUBBERS.

FUEL-MACHINE, for Compressing Breeze and Tar.

N.B.—Pamphlet, with Twenty-Eight Illustrations and Letterpress, on the Construction of Gas-Works, will be sent, post free, on receipt of 4s. in stamps To be had of the AUTHOR; or at the Office of the "JOURNAL OF GAS LIGHTING."

PRICES AND ALL PARTICULARS TO BE HAD OF THE PATENTEE,

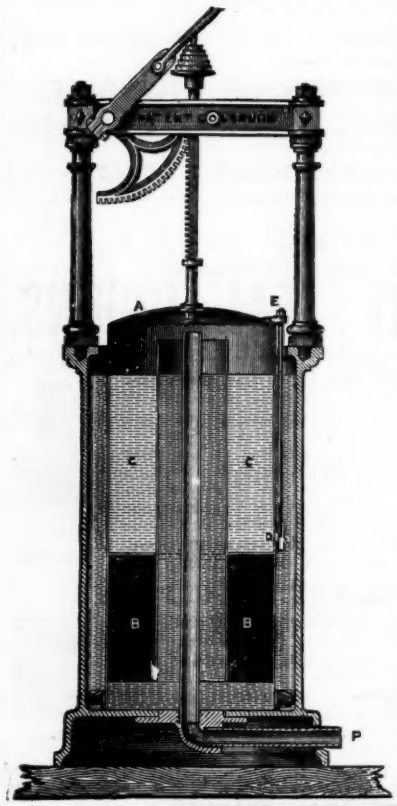
35a, GREAT GEORGE STREET, WESTMINSTER, S.W.

GEORGE WALLER & CO.,

GAS AND HYDRAULIC ENGINEERS,

Patent Compensating Steam Governor,

WITH SELF-CONTAINED WATER-BALANCE.



This is the most efficient and perfect Governor yet made to control and regulate the speed of Engines and Exhausters according to the varying make of gas, and maintain a steady gauge, whether working level or with six inches of seal.

It is the only Governor that will effectually control Condensing and Compound Engines, especially when the Exhauster is on light work, and the Engine is large.

During the drawing and charging of Retorts, the Engine requires no attention—a matter of great importance in small works.

Descriptive Circular sent on application.

They are in use at

BECKTON,
HAMPTON WICK,
DUKINFIELD,
HARTLEPOOL,
NEWCASTLE-ON-TYNE,
RAMSGATE,
SUTTON,

and about 30 other works.

G. W. and Co. make **special Steam Throttle Valves,** suitable for working with this Governor, and alter existing Throttle Valves to same plan.

See also advertisement, page 491.

PHŒNIX ENGINEERING WORKS,

Holland Street and Bear Gardens, Southwark, S.E.

J. & H. ROBUS,

BUILDERS AND CONTRACTORS

FOR THE ERECTION AND REBUILDING OF GAS AND WATER WORKS,

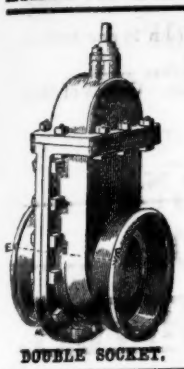
RETORT-SETTING—A SPÉCIALITÉ.

ROBUS'S IMPROVED RETORT-SETTINGS, guaranteed to Carbonize a large amount of Coal with a small per cent. of Fuel.

ESTIMATES GIVEN FOR MAIN-LAYING.

N.B.—All kinds of Fire Goods and Gas Apparatus supplied on the shortest notice.

Address:—J. & H. ROBUS, BELL GREEN, CATFORD, LONDON, S.E.



DOUBLE SOCKET.

IMPROVED SCREW-VALVES,

For Water, Tar, Ammoniacal Liquor, &c.

MADE EITHER WITH FLANGED OR SOCKET ENDS.

B. DONKIN & Co.

BERMONDSEY, LONDON, S.E.

GEORGE ORME & CO.,

ATLAS METER-WORKS, OLDHAM,

MANUFACTURERS OF

WET AND DRY GAS-METERS,

STATION-METERS, GOVERNORS,

PRESSURE AND EXHAUST REGISTERS,

LAMP-METERS IN CAST-IRON BOXES,

And every Description of Gas Apparatus.

PRICE'S PATENT COKE & COAL BARROW

effecting a great saving of time, labour, and expense.

For particulars, price, &c., apply to Mr. E. Price, Inventor and Patentee, Gas-Works, Hampton Wick, Middlesex.

Prices are Reduced.

TUBES

TUBES AND FITTINGS
For Gas, Steam, and Water, Galvanized, Enamelled, or Coated by Dr. Angus Smith's Patent Process.
Gas-Fitters' Tools, Brass & Copper Work, Socket-Pipes, Roofing, and all Kinds of Ironwork for Gas and Water Works.
JOHN SPENCER,
VULCAN TUBE-WORKS,
WEST BROMWICH, STAFFORDSHIRE.
LONDON OFFICE:
ST. CANNON STREET, E.C.
J. E. & S. SPENCER, Agents.

BELGIAN CLAY RETORTS.

J. SUGG and CO., late ALBERT KELLER, GHENT.—The removal of the import duties on Earthenware permitting the entry of Clay Retorts into England, Messrs. Sugg, of Ghent, beg to draw the attention of the Gas Companies of London, and other Cities, to the very superior quality of the RETORTS manufactured by them. They can be made of any size, in one piece, and of any form. The price will be in proportion to the weight, and very moderate in comparison to their value.

Communications addressed to J. Sugg & Co., Ghent, will receive immediate attention.

THE WIGAN COAL & IRON COMPANY,

LIMITED,

District Office: 97, NEW STREET, BIRMINGHAM; Agent: W. M'GOWAN,

Supply the Best Wigan Arley Mine Gas Coal, Gas Nuts, Gas Cannel, &c.

N.B.—The Wigan Coal and Iron Company, Limited, are exclusive owners of the well-known HAIGH HALL AND KIRKLESS HALL GAS COAL COLLIERIES.

MESSRS. FLETCHER, BURROWS, & CO.,

ATHERTON COLLIERIES, near MANCHESTER,

ARE PREPARED TO MAKE CONTRACTS FOR THE SUPPLY OF

CANNEL AND OF THEIR ARLEY MINE GAS COAL,

WHICH ARE OF ACKNOWLEDGED EXCELLENCE.

Their Coal is in use in the Salford, Stafford, Bolton, and other large Gas-Works in England, Ireland, Wales, and Abroad, giving in practical working 10,300 feet of 17-candle Gas, and 15 cwt. of superior Coke per Ton of Coal.

PARIS EXHIBITION, 1878.

THREE MEDALS

AND

HONOURABLE MENTION

HAVE BEEN AWARDED TO

JOSEPH CLIFF & SONS

For their Various Exhibits, amongst which is a

SILVER MEDAL

FOR THEIR

PATENT MACHINE-MADE

RETORTS AND FIRE-BRICKS,

Being the Highest Honour given for this class.

Established

1795.

JOSEPH CLIFF & SONS,

THE ORIGINAL

WORTLEY FIRE-BRICK WORKS,

NEAR LEEDS,

London Wharf: No. 4 inside Great Northern Goods Station, King's Cross, N. Liverpool: Leeds Street.

SPECIAL NOTICE.—Our Patent Machine-Made Retorts have now been thoroughly tested, and have proved themselves infinitely superior to those made by hand. At several large works it has been settled, beyond question, that, owing to the compactness and general excellence, more gas is sent to the gasholder from each ton of coal carbonized than is the case with hand-made Retorts.

NEW PATENT WET GAS-METER,

THE "RELIANCE,"

MANUFACTURED BY THE

GAS-METER COMPANY, LIMITED,

238, KINGSLAND ROAD, LONDON; UNION STREET, OLDHAM; HANOVER STREET, DUBLIN.

The object attained by this invention is the *correct measurement of Gas under every fluctuation of the pressure.*

Accuracy is obtained by subjecting the whole of the water which determines the measuring chambers of the drum to one uniform even pressure, and so prevents unequal displacements of the water-line.

The "RELIANCE" METER has been tested by several of the most experienced official meter inspectors. Copies of their reports may be obtained on application to the

GAS-METER COMPANY, LIMITED,
238, KINGSLAND ROAD, LONDON.

ALEXANDER WRIGHT & CO.

WET & DRY GAS METERS.

STATION METERS AND GOVERNORS.

JONES'S THROTTLE-VALVE GOVERNORS.

JONES'S DISTRICT GOVERNOR,

The simplest and best Instrument extant for checking Excess of Pressure in hilly districts.

GAUGES AND TESTING APPARATUS OF ALL KINDS FOR GAS.

55, 55a, & 56, MILLBANK STREET, LONDON, S.W.

R. LAIDLAW AND SON,

EDINBURGH AND GLASGOW.

Manufacturers of

CONSUMERS IMPROVED WET GAS-METERS,

THE UNVARYING WATER-LINE GAS-METERS,

IMPROVED DRY GAS-METERS, in Cast-Iron or Tin-Plate Cases;

STATION-METERS, ALL SIZES, up to 15 feet Square, with PLANED JOINTS;

Experimental Meters, Photometers, Pressure-Gauges,
Governors, Test Holders, &c., &c.

LONDON OFFICE:

6, LITTLE BUSH LANE, CANNON STREET, E.C.

AUTOMATIC GOVERNOR BURNER.

PRESSURE

FROM GASHOLDER TO BURNER.

The Royal Scottish Society of Arts, in 1876, awarded to D. BRUCE PEEBLES the KEITH MEDAL for his inventions relating to Station and District Governors; and, in 1879, the KEITH MEDAL for his invention of the Needle Gas Governor. The Committee appointed by the Society to examine the merits of the Needle Governor, consisting of the following eminent scientific gentlemen, viz.:—Dr. Stevenson Macadam, John Reid. Esq., late of the Edinburgh and Leith Gas-Works, and John Milne, Esq., Milton House, summed up their report by stating, "Your Committee have had the advantage and privilege of experimenting with the Needle Gas Governor, and are convinced that this Governor is the most perfect instrument which has been invented up to this time for controlling the flow of gas."

PEEBLES'S Patent Gas Governors place in the hands of Gas Engineers the means of Controlling Pressure in all situations and circumstances. Safety Station Governors, Metallic Dry District Governors Metallic Needle Lamp Governors, Consumers Governors, and Domestic Automatic Governor Burners.

WET AND DRY GAS METERS OF SUPERIOR EXCELLENCY, STATION METERS, &c.

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